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FINANCIAL STABILITY OF PUBLIC-UTILITY COMPANIES.

When launching a public-utility enterprise, promoters and managers have usually provided for rates for service such that if the enterprise is at all successful and business built up to even a moderate extent, the gross revenues will be sufficient not only to provide for operating expenses but to return substantial dividends to the investors. In populous communities such returns can usually be counted upon from the start, but in less developed communities electric railways and other utilities have frequently been compelled to operate for several years without earning their way, depending upon the development of the community for their ultimate success. To cover the risks involved under such conditions it has been quite customary to issue considerable common stock as a bonus to investors, with the idea that the dividends paid upon these will yield an unusually large return eventually.

In some utilities, however, the enthusiasm of the promoters combined with the failure to realize the necessity of making allowances for depreciation have led to the establishment of a scale of rates which was insufficient to properly maintain the property at its highest efficiency and also to pay a fair rate of return upon the investment. Such conditions have been especially noticeable among the telephone companies in the smaller towns and among the irrigation companies of the West. While it is always possible for a utility to reduce rates when its income is found to be larger than necessary, it is a hard matter to raise rates after a lower schedule has once been in operation. Companies confronted by a deficit in the treasury are sometimes, in consequence, not only temporarily embarrassed, but are not in a position to look forward to even ultimate financial success.

The conditions under which the rates for service by public-utility companies may be raised are discussed in our LEGAL NOTES this week and the hopeless position of certain companies which have not made provision for such a contingency as this in the original franchise is pointed out. The much more satisfactory condition existing in those states having satisfactory public-utility laws, with provision for the regulation of rates by a commission, is most effectively brought out in this connection. In those states there is little difficulty in obtaining permission to raise the rates if it can be shown that under proper management the gross revenues are insufficient to give good operating service, to provide for depreciation and to pay a fair return upon the investment which has been made.

The conditions in Wisconsin form as good an illustration of the benefits conferred upon the investors in the securities of public-utility companies as can be found. In that state the Commission has consistently refused to lower rates where lowering was not justified by the financial status of the operating company, and has, indeed, in some cases ordered an increase in rates. In one recent case the Commission refused to permit a lowering of rates even where the representatives of the company advocated it, since in the opinion of the Commission such a lowering would be an injury to the investor and ultimately, possibly, to the consumer also.

That the operations of such a public-service commission not only protect the consumer but are of benefit to the investor also, has been testified by Mr. Gardiner E. Stickney, vice-president of the Wisconsin Trust Company, who in a recent publication stated:

"In this state, the commonwealth itself has placed a system of safeguards around this form of investment through the establishment of the Railroad Commission of Wisconsin and the extension of its powers to include the supervision to some extent of the issuance of stocks and bonds and of the operation of public utilities.

"Bonds of Wisconsin public utilities may be purchased today with the assurance that the proceeds of the sale of those bonds have gone into the property; that the purposes for which that money has been spent have been passed upon and approved by the Commission, and that the company whose obligation the banker holds will not be subjected to unjust or ruinous competition.

"For years conservative bond dealers have refused to handle the bonds of a public-utility corporation whose franchises did not extend well beyond the maturity of the bonds. All Wisconsin public utilities are now operating under indeterminate franchises from the state, which simply means that they have from the state the right to operate without competition if they fairly and fully serve their respective communities."

Further testimony to the improved conditions in Wisconsin is given by a prominent business man of Eau Claire, from whom the following is quoted:

"Business has grown in Wisconsin since the enactment of the Railroad Commission and Public Utilities laws. The investor has a better chance, dividends are sure and regular, securities are safe, new business concerns are coming in, railroads are extending their lines, and all business is increasing every year. The lower rates imposed by the Railroad Commission have increased business and profits."

It will be evident that, with a public-utility law which has provided protection for the investor as well as the consumer, conditions are much better than in those communities where the utility company must periodically fight for a renewal of its franchises, or where, when reverses come, it has no means of increasing its depleted revenues. Investors in public-utility securities have nothing to fear from the proper kind of an act regulating public utilities where the administration of such a law is in the hands of properly qualified commissioners.

MAINTENANCE OF ELECTRIC SIGNS.

The primary object of an electric sign is to advertise a place or thing. In order to do this effectively an appealing design has usually been carefully selected. Whether the sign is of the simplest character or of the intricate moving kind, each element, word or even letter is essential to the message to be conveyed. Neglect of this self-evident requirement nearly always defeats the object desired.

It is surprising, therefore, to find occasionally signs with letters and even whole words missing. The resulting effect is generally ludicrous, if not grotesque, and not infrequently it only brings ridicule for the merchant or company whose carelessness or neglect is responsible. Among many cases of this kind that have come to our notice, only one or two need be mentioned to illustrate these points. A prominent apothecary had a simple sign with the word "Drugs" in front of his store. For over a week the first letter of the sign was not lighted and, since the letters were of the box form and did not illuminate each other, the impression one got from a distance was that the store probably had an assortment of oriental rugs for sale. Another, almost horrible, example is at the terminal station of a prominent electric interurban railroad whose sign is chronically almost illegible because of burned-out lamps in all parts of the sign.

Such a condition does not reflect credit on the organization back of it, particularly in view of the fact that proper sign maintenance is neither an expensive nor difficult undertaking. Central stations that have a considerable number of sign customers usually agree to maintain them at a very low cost per month. This form of maintenance is the most reliable, because the central-station company wants a satisfied customer and desires to extend its sign-lighting business. If the current is supplied from a private isolated plant, some one in attendance should be designated to see that the sign is kept in proper order. Where a flasher is not used, the sign is more liable to be neglected because of the little attention required to replace occasionally burned-out lamps, whereas a sign flasher needs periodical inspection anyhow.

Signs that are wired on the series or series-multiple plan are much more liable to be blemished by a burnout of a single lamp. On alternating-current circuits this method of wiring is entirely unnecessary because, if low-voltage lamps are used, a step-down sign transformer can be installed at low cost to permit all the lamps to be run in multiple. Even for direct-current circuits multiple wiring is generally possible, since ten-watt tungsten sign lamps are now obtainable for 110 to 130 volts, and even five-watt tungsten lamps can be obtained for half this voltage, so that only two of these need be used in series on standard voltage. The ten-watt tungsten lamp gives 40 per cent more light than the old 20-watt carbon lamp, so the desirability of using it is evident. For

500-volt direct-current railway circuits groups of five series lamps may still be employed on relatively small or unimportant signs, but if the sign is large or very conspicuous a small motor-generator set will prove a wise investment, unless the sign is kept under regular and frequent supervision. The practice of some railway companies of using up their old and nearly blackened lamps in electric signs is not to be recommended, however, because at best it gives an uneven appearance to the sign and requires much more frequent lamp renewals and closer attention for proper maintenance.

SCHOOL INSTRUCTION IN ELECTRICITY.

As noted elsewhere in these columns, the Department of Electricity of the city of Chicago will recommend in its next annual report, which is soon to be issued, that instruction be given in the public schools of the city in the matter of avoiding accidents from electric shock.

It would seem that instruction of this nature might be made very effective if given in connection with a thorough and careful study of the elementary principles of electricity, such as is always included in a good first course in physics. To the student without some such elementary training in electricity, however, it would be largely a matter of memorizing facts the reasons for which would not be understood, and which would therefore usually soon be forgotten. The suggestion, though, is unquestionably a good one for the consideration of persons engaged in teaching elementary physics and those in charge of courses of instruction.

The investigation by the department referred to shows that in Chicago a large proportion of the electrical accidents which occur are suffered by electricians, and are the results of carelessness rather than of ignorance. This is probably the condition everywhere and will continue to be so. People working constantly with electrical apparatus are very liable to acquire a degree of carelessness that is anything else than conducive to personal safety. Realizing this condition, some of the larger electrical manufacturing companies have their employees given instruction regularly in the best methods of resuscitation in cases of severe electric shock. This sort of instruction could also be very profitably given in the schools teaching the elements of the science of electricity. Material for teaching this sort of thing is not found in the textbooks, as a rule, but it is always easily available from other sources.

Fatalities from electric shock are relatively infrequent when compared with those resulting from the use of other forms of energy for light and power. But they should become even less frequent than they now are, and the proper effort in the public schools of the country would undoubtedly contribute in no small measure toward bringing about this desirable condition.

PROTECTING THE SERVICE.

It is an interesting fact that there are many people in the country habitually honest in their dealings with other individuals who are not always inclined to a strict observance of the proper moral code in matters between them and some corporation. This accounts in a measure, no doubt, for the fact that central stations are frequently annoyed by the loss of current through processes practiced by customers which, viewed in the proper light, can only be classed as plain stealing. It appears, indeed, that the theft of current is so common that central-station men are nearly always glad to consider suggestions as to practical means of preventing it.

A gentleman who has charge of the wiring for one of the large electric-lighting and power companies, writing in these columns not long ago, recommended, among other schemes, that of sealing the service cutout cabinet and running from the cabinet to the meter in conduit, even in cases where exposed wiring is employed in the building. While this sort of arrangement might be satisfactory from the standpoint of the central station, it is open to the objection that the service switch would not be left accessible to the occupant of the building and hence he might not be able to cut the entire current off from his premises in case such a procedure should at any time become necessary or desirable. It would seem that when such an arrangement is employed, there should always be an additional main-service switch between the meter and the load, and that this should be readily accessible to the user of the service. An arrangement like this, aside from preventing the theft of current, would possess the additional advantage of protecting the fuses and thus preventing the overfusing of the service by irresponsible persons.

In the case of a large industrial plant employing motor drive the sealing up of the main fuse cabinet by the central station might work a hardship on the property owner, since these fuses are more liable to be frequently blown than in the case of a residence load. A great improvement, however, over now frequently existing conditions could be effected by having all fuse cabinets in plants of this kind locked by responsible foremen and not left open to such employees as would replace fuses with copper wires or perform similar undesirable acts. It is not unusual in industrial plants to find cartridge fuses in use in which the fuse has been paralleled with a copper wire soldered to the brass ferrule at each end. This means, of course, that circuits and apparatus are left without protection and the property owner, central station and insurance company all thus treated unfairly.

It is not very unusual for the management of industrial plants in which electricity is employed extensively to have switch and fuse cabinets divided into two compartments, the idea being to protect workmen from coming in contact with live parts of the circuit and at the same time to leave the switches to branch circuits accessible. It would seem that boxes arranged in this way might easily be provided with means for locking the compartment containing fuses.

Plans for Fourth Annual Northwestern Electrical Exposition.

Plans that were started some 14 months in advance for the 1913 or fourth annual Northwestern Electrical Exposition were perfected at a meeting of the Board of Directors held in Minneapolis, May 28, and the definite date selected for this event was the week of March 15-22, 1913.

It is now definitely assured that the new Minneapolis Coliseum, now being erected, will be completed well in advance of this date and will, therefore, be available for this show., The unusual success in all respects of the last show, together with the new building, has spurred the management on, and it is planned to carry out still further the encouragement of exhibits and patronage that results in unusually large amount of business being transacted. This was a noticeable feature particularly of the last exposition.

R. W. Clark, assistant commercial agent of the Minneapolis General Electric Company, has again been chosen manager for the next event, which is to be held in the new Coliseum addition to the Armory on Kenwood Parkway, Minneapolis.

The sixth annual convention of the Minnesota Electrical Association is to be held at the same time and place as the Electrical Exposition.

The American Institute of Electrical Engineers, under the auspices of the Minnesota section, will also hold a big Northwestern meeting at the same time and place. There will also be a large rejuvenation of the Sons of Jove and one or two other electrical organizations convene at the same time.

An Electrical Meterman's Handbook.

The National Electric Light Association's Committee on Meters has prepared for publication the *Electrical Meterman's Handbook*, which will be distributed at the Seattle convention.

This book should be of greatest interest and value to all company and individual members who are interested in the measurement and sale of electricity, as it will contain practically all authoritative information required by any one in charge of the operation of electric meters, from the standpoint of the executive, the installation, or the testing department, and for the guidance of civic commissions. It has been compiled with strict adherence to the viewpoint that there was an urgent need for authoritative action toward the establishment and elucidation of standard modern electric meter practice, and the compilation of available data in one place for ready and convenient use of the testers and metermen of the thousands of companies whose technical abilities are more or less limited, as well as those of larger companies whose organization is more complete. It is believed that the former companies and individuals wil quickly recognize its great value to the individual and that the latter will seize the opportunity to put into the hands of the personnel of their organizations a handbook of meter practice and information which when utilized will rebound to the great benefit of the organizations as well as the individual.

Every effort has been made to make the matter understandable by the nontechnical man, by elimination of cumbersome mathematical demonstrations and details; although full, simple and satisfactory explanations are always included. The handbook is not intended to supplant the Meter Code, which is a more technical and scientific work, and which does not set itself the task of supplying details of operation and testing as is done by the handbook. The latter is therefore supplementary to the former and completes the necessary bibliography on this subject.

Railway Men Complete Tour.

The executive officers of the American Electric Railway Association and the American Electric Railway Manufacturers' Association, who have been touring the United States on a campaign of missionary and educational work, brought their trip to a close on May 30, when they arrived home in New York City. The party covered 34 states, making stops in 30 cities, in each of which President Thomas N. McCarter made a speech. Occasion was taken in these speeches to point out the misapprehension that exists in the public mind as to the earnings of railway companies, Massachusetts being pointed out as an example. In that state approximately only one-half of the electric railway companies pay dividends. The difficult problems arising from the fixing of the nickel as a universal unit of fare were pointed out and the desirability of a zone system of charges emphasized.

Opportunities for Sale of Electrical Goods in Tasmania.

By January 1 of next year, Hobart and other near-by towns on the island of Tasmania (near New Zealand and Australia), will be supplied with cheap electric energy for lighting and power purposes derived from water-power resources and this ought to stimulate a demand for electrical materials and apparatus, of which American manufacturers might take advantage. The city of Launceston, which now has a limited supply of cheap electric power, will doubtless have larger supplies available in the near future, and it seems only a matter of time when probably most of the towns of Tasmania will be electrically developed. The estimated cost of providing the electricity contemplated and of erecting some metallurgical works in connection therewith is $1,200,000. Manufacturers expect later on to use the electric power not only for the treatment of complex Australian ores, but also for the manufacture of calcium carbide, calcium cyanide, etc.

New Plan Proposed for Election of Institute Officers.

The St. Louis Section of the American Institute of Electrical Engineers appointed a committee on October 11, 1911, to report upon the advisability of recommending constitutional amendments concerning methods of nominating and electing officers of the Institute. At the April meeting of the Section the report of this committee was adopted and forwarded to the Board of Directors for consideration. At the meeting of the Board of Directors on May 21 the report was ordered published in the Proceedings, so that the subject may be fully discussed at the Boston convention.

The report shows a study of the geographical distribution of the membership of the Institute, and the fact that the present Board, as is customary, is made up largely of members residing in New York City and vicinity. The states west of the Mississippi River have no representation upon the Board and the representation from New England and the Southern States is much less than their numerical proportion would warrant. This condition is contrasted with the geographical distribution of the members of the governing boards of the American Society of Mechanical Engineers and the American Society of Civil Engineers, in the latter of which geographical representation is required by the constitution. The committee, which consisted of A. S. Langsdorf, A. H. Timmerman and H. I. Finch, considers it desirable that this condition should be changed by constitutional amendment and that provision be made, by defraying the traveling expenses of officers to New York meetings, for not only representation but participation by all sections of the country in the government of the Institute.

The committee also calls attention to the anomalous conditions existing with respect to the functions of the section delegates.

The committee also recommends that the New York meetings be placed upon the same footing as section meetings held in other cities.

Frederic P. Vose.

Though not an electrical man so far as training in the technical sense is concerned, F. P. Vose is probably one of the best-known men in the electrical fraternity. A prominent attorney, a member of the law firm of Page & Vose, Chicago, he represents a very wide clientele of electrical manufacturers, jobbers and several public-service corporations devoted to electrical utilities.

Frederic Perry Vose was born in Chicago, May 4, 1870, the son of William M. R. and Patience E. (Watts) Vose. His father was a native of Massachusetts and his mother a daughter of Rhode Island. In 1873 the family moved to Evanston, Ill., where they have resided ever since. Fred was educated in the Evanston public schools and high school and at Northwestern University, receiving his degree of LL. B. upon graduation from this institution in 1894. He was admitted to the bar after passing his bar examinations in 1893.

He began the practice of his profession immediately upon being admitted to the bar, and found among his earliest clients a number of electrical manufacturers and jobbers. This acquaintanceship and clientele led to his election as permanent secretary of the Electrical Trades Association in September, 1896. In the summer of 1898 he drafted the constitution of the original Electrical Supply Jobbers' Association and became its Commissioner, serving until 1901, when, as general secretary, he was succeeded by Franklyn Overbagh, who has since been the honored incumbent.

Frederic P. Vose,
General Secretary, National Electrical Credit Association.

Mr. Vose has always been a student of corporation accounting, economics and business credits. He had great gift for the handling of the details connected with this phase of industrial effort, and his wide acquaintance in the electrical field led to his being selected as general secretary of the National Electrical Credit Association upon its organization in the fall of 1898. This post he has held ever since. In April, 1902, he organized the Pacific Coast Electrical Credit Association in conjunction with Charles M. Wilkins, of Partrick, Carter & Wilkins, and in July of the same year organized the Electrical Trades Association of Canada.

For his clients in the electrical field he has accomplished a great deal, prosecuting the matters left to his adjustment with rare tact, great zeal and consummate intelligence. Among his prosecutions against offenders in the theft of electrical material he achieved a signal victory for justice in securing the conviction of Ralph Lipsey for the reception of stolen goods. This case was twice taken to the Supreme Court, was attended by several of the most important issues ever heard at the Chicago bar, and upon its completion had established the status of the law for the conviction and punishment for this offense in the State of Illinois.

Mr. Vose is a member of the Union League Club, University Club of Chicago, University Club of Evanston and Evanston Golf Club. He is a member of the Electric Club of Chicago, of which he was president in 1909 and 1910, filling the vacancy caused by the resignation of C. A. S. Howlett in the fall of 1909 and elected to succeed himself the following year. He has been a member of the Rejuvenated Sons of Jove since January 27, 1909 and has served as statesman-at-large during the last three administrations.

Of austere and scholarly bearing, Fred Vose is one of the most democratic and lovable men we know. His friends are legion and his reputation for integrity and genuine altruism toward his fellow-man are a matter of pride among his acquaintances. He is keenly interested in the work and welfare of his home surrounding, a director of the Evanston Hospital, a staunch Presbyterian, devoted to his church. His charming wife, who shares with him so many graces and such distinction, was Miss Lucy B. Mason, and they were married in January, 1900.

Michigan Section to Take Cruise.

The annual convention of the Michigan Section of the National Electric Light Association will be held on board the steamer *Majestic*, which will cruise through Lake Huron and Georgian Bay from June 21 to June 25. The cruise will start from Port Huron at 1 p. m. on Friday, June 21, and will return to the same point at 1.30 p. m. on Tuesday, June 25. Stops will be made during the trip at Penetang, Parry Sound, Sault Ste. Marie and Mackinac Island.

The following papers are to be presented: "Fuel Analysis and Boiler-Room Economies," by Norman G. Reinicker; "Power-Factor, Load-Factor and Diversity-Factor," by Calvert M. Wardwell; "Some New Alternating-Current Consuming Devices," by A. B. Hoffman; "Electric Service on the Farm," by George D. Slaymaker; "Some Experiences in Operating Small Plants," by Robert S. Stewart; "Ornamental Street Lighting," by a representative of the General Electric Company; "Contract Routine," by R. T. Duncan. The president of the Section, R. W. Hemphill, Jr., will make his annual address and there will be an address by C. L. Glasgow, chairman of the Michigan Railroad Commission.

A delightful outing is anticipated by all who have attended the past conventions of this section. Reservations for the trip, accompanied by remittance of $30. should be filed as soon as possible with the secretary, Herbert Silvester, 18 Washington Avenue, Detroit, Mich.

Electrochemical Society Meeting.

The fall meeting of the American Electrochemical Society will be held in New York City in September in connection with the Electrochemical Section of the International Congress of Applied Chemistry.

NATIONAL ELECTRIC LIGHT ASSOCIATION.

Thirty-Fifth Convention, Seattle, Wash., June 10 to 13.

During the week the several special trains going to the Seattle convention of the National Electric Light Association, which will be held on June 10, 11, 12 and 13, left on schedule time, bearing in every instance a fine happy party of enthusiastic travelers. The big "Red Special" which left New York on Sunday, May 26, visited in turn Chicago, Kansas City, Albuquerque, Laguna, the Grand Canyon, Riverside, Pasadena, Los Angeles, Santa Catalina Island, Santa Barbara, Del Monte, San Francisco, Mount Shasta, Portland and Seattle.

Group of Passengers on Train No. 2 Before Leaving Chicago, June 4, for Seattle Convention.

On Thursday, June 6, a banquet and entertainment was given to the eastern delegation at the St. Francis Hotel, San Francisco, under the auspices of the Electrical Development League.

Train No. 1, on Tour B, visiting Bauff Hot Springs, Lake Louise, going through the Canadian Rockies to Glacier, Fraser Canyon and Vancouver, left New York on Monday, June 3, under the personal direction of J. C. McQuiston. Train No. 2, on Tour B, under the direction of G. A. Freeman, left Chicago on the morning of Tuesday, June 4.

The time of the "Orange Special," under the direction of W. H. Hodge, was changed from 4:30 p. m. Thursday, June 6, to 10:15 p. m. of the same day, running as the second section of the famous "Olympian" over the Chicago, Milwaukee & St. Paul and the Chicago, Milwaukee & Puget Sound.

The full program of the Seattle convention was published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for June 1. The convention will be formally opened with a reception and inspection of the exhibits on the evening of June 10. The first general session will be held on Tuesday morning, at 10:00 o'clock. On Tuesday at 2:30 p. m. there will be a commercial session, an accounting session and a technical session. On Tuesday evening at 8:30 o'clock there will be a power transmission session, and a second commercial session. On Wednesday morning at 10:00 o'clock there will be a second general session and executive session, the executive session continuing between 12:00 and 12:30. The second technical session will also be held Wednesday morning, and there will also be an accounting session.

The second power transmission session, the third commercial session and the third accounting session will be held on Wednesday afternoon at 2:30 o'clock.

On Wednesday evening at 8:30 o'clock the public policy session will be held. This will consist of a musical program, the reading of the report of the Public Policy Committee, the report of the medical commission on resuscitation from shock, and a lecture by D. B. Rushmore on "The Electrification of the Panama Canal."

The fourth commercial session and the third technical session will be held on Thursday morning at 10:00 o'clock. On Thursday afternoon at 2:30 o'clock the third power transmission session and the third general session and executive session will be held.

The convention will close with the company section session on Thursday afternoon at 3:00 o'clock. This session will include the report of the committee on the award of the Doherty gold medal, a discussion of the paper by H. E. Grant entitled "Educating Central Station Employees," a report by T. C. Martin, secretary of the National Electric Light Association on "The Proposed Company Section Lecture Bureau," and the session will close with an experience meeting as to company-section work.

New Membership Classification of Commonwealth Edison Section, N. E. L. A.

By the recently revised constitution of the Commonwealth Edison Company Section of the National Electric Light Association, membership in the Section is limited to employees of the company who are class B members of the National Association, other class B members who are vouched for by an executive officer of the company, and class E members of purely local business affiliation who have business with the company.

Electrical Fourth.

The Fourth of July Committee, of New York City, is considering the matter of having an electrical celebration of the Fourth of July in place of the old-fashioned display of fireworks. The New York Edison Company has offered to furnish the necessary current for illumination free of charge.

Heavy Copper Exports.

Copper exports last month amounted to approximately 73,000,000 pounds and domestic deliveries are estimated at 65,000,000 pounds, a total of 138,000,000 pounds. If production is no larger than it was in April, the decrease in surplus stocks in May amounted to between 10,000,000 and 15,000,000 pounds.

Electricity in Foundries.

Central-station power for foundries has become so universal that only the most unprogressive can ignore its many advantages. This article comments particularly on motors for cupola blowers, lifting magnets and lighting. Data on typical installations are also given.

The application of electric motors to foundries has become so universal that this article will treat only of the important factors in the electrification of such establishments. The scope of this discussion is limited to the foundery proper, machine and pattern shops being subjects for subsequent articles.

Modern processes for the production of all grades of steel have been brought to such a state of perfection that this metal has to a large extent superseded cast iron in many engineering structures and machines. In the opinion of many engineers this tendency has perhaps been carried too far, with the result that steel and wrought iron are often employed for duties which could be performed by cast iron with equally satisfactory results.

Motor-Driven Tumblers in Foundry.

The main problem upon which the iron founder is at present engaged is to obtain a cast iron of a sufficiently high grade as to uniformity, tenacity, hardness and density, to enable it to regain its old position in the eyes of mechanical engineers for certain classes of work—a position which has been usurped by steel or wrought iron, phosphor bronze and other more costly alloys.

Conservatism, or the tendency to cling to traditional practice, has in the past hampered the iron-founder's art and retarded its progress; but of recent years greater enterprise has been evidenced, and close attention is now being paid to ways and means of perfecting all the details of the craft which go towards improving the nature of the finished product.

The question of molding constitutes in itself a study for the specialist, and presents a large field for the introduction of labor-saving machines; and although the personal element in this department will always be conspicuous, machine molding is obtaining a wide popularity for a variety of work. The intermediate stage concerns the design and operation of the cupola itself, and any advantage which may be obtained from other refinements may be negatived through neglect of the importance of this stage.

In the operation of the cupola one of the most important points to be considered is the source of power that supplies the air to the fuel; and this brings us to the question of the requirements which must be fulfilled by the fan or compressor, or whatever device is employed for furnishing the driving power of the air supply.

The problem of providing a proper supply of air for the operation of a

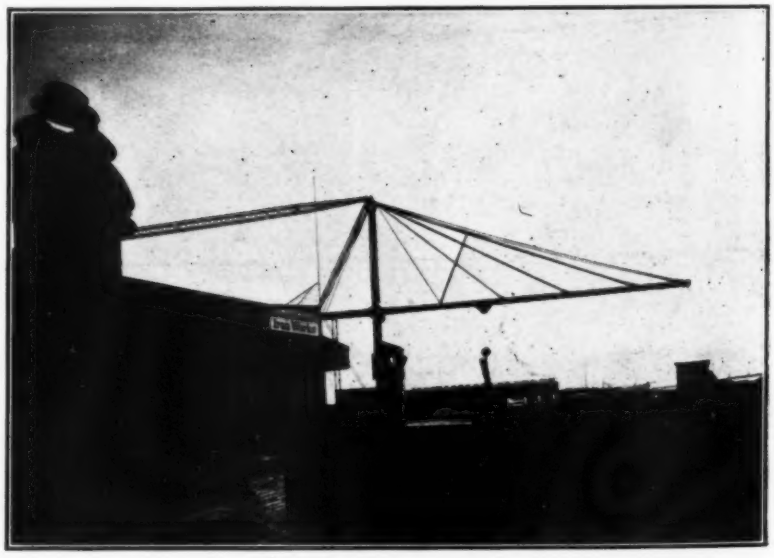
foundry cupola is in many respects similar to the problem of providing a proper supply of air to a blast furnace. The blast furnace requires much larger volumes of air, and under more arduous conditions, since its operation is continuous for many months; whereas the foundry cupola is in operation only through a few hours each day. The latter, therefore, is not subject to the great variations in conditions of operation which occur in blast furnaces due to this long continuous operation, and, moreover, operates under improved conditions owing to the differences between the physical characteristics of the charge of pig iron, as compared with the physical characteristics of the ores which are charged in the blast furnace. Therefore, the blast conditions in the cupola are much more uniform than they are in the blast furnace, and the requirements for properly operating a cupola under all conditions can be met by apparatus which produces practically a constant pressure; whereas, in the blast-furnace apparatus, constant volume is the prime requisite, and apparatus must be provided capable of working under a considerable range of pressures in order to meet the fluctuating conditions encountered in the operation of the furnace.

Centrifugal compressors have been used for some five or six years in England and on the continent, consisting generally of one or more rotating impellers in series, taking air at atmospheric pressure and compressing it to pressures required for the service of the blast furnace, that is to say, 12 to 15 pounds average pressure, and 25 to 30 pounds maximum, with provision for passing air at a constant rate; but no machines of the type mentioned were put on a blast furnace in this country previous to March, 1910, when the first was put in service at the Oxford Furnace of the Empire Steel & Iron Company, at Oxford, N. J. This apparatus has been found to be excellently adapted for the requirements of blast-furnace blowing, and a number of machines of various capacities are under construction for similar situations as a result of the good performance of these first machines. Similarly with regard to cupola work in the iron foundry, it has been found that this type of apparatus is perfectly adapted for use in connection with a furnace for melting iron; and the same reasons which render it suitable for blast-furnace service are also found to apply in the case of the cupola.

One of the important points in connection with this apparatus, which is of benefit in cupola work, is the extreme steadiness of the blast. The steady melting of iron and the steady descent of the charge from the cupola are dependent on the maintenance of uniform conditions of air pressure, because the charge in the cupola is, to some extent, supported by the pressure of the blast; so that if this pressure varies, the charge is likely to descend in a more or less irregular manner, causing an irregular, unsatisfactory working of the cupola. The uniform, steady blast produced by the centrifugal compressor therefore produces more uniform, steady conditions of melting.

Another point which is of importance in this connection, is the high efficiency of the centrifugal compressor, and the maintained efficiency after long periods of service. This efficiency is due to improvements made in the design of the apparatus, as compared with the centrifugal fans which have often been used for this purpose, and which are, by comparison, very wasteful in power absorbed. In the case of the centrifugal compressor, the velocity impressed on the air by the movements of the impeller, is changed into pressure by the gradual slowing down of the air; and the fundamental principle which is responsible for this improvement in efficiency, and which has been observed, is that the slowing down of the air must be done in a perfectly definite manner, and without the production of any eddies.

Motor-Operated Pouring Bucket.



Electric Crane in Foundry Yard.

The principal difficulty which has been met with in the installation of such compressors in connection with iron-foundry practice, has been that the requirements for air have been over-estimated by the purchaser, and in many cases the apparatus which was installed was found to be too large. Owing to the fact that all the data which have been compiled on the requirements of air on the cupola have been based on figures of displacement made in the manner above indicated, there is a tendency to over-estimate the quantity of air required. Tests have been made on a cupola in actual service melting iron in an efficient fashion, and it has been found that the quantity of air required for melting iron in the cupola was considerably less than that usually supposed. For instance, the well-established rule for the selection of positive-pressure blowers for iron-foundry cupolas is based on allowance of 30,000 cubic feet displacement for one ton of iron. This rule has been reinforced by computations of the number of cubic feet of air required for burning one pound of carbon to CO_2, and the further fact which has been established experimentally, that one pound of coke is sufficient to melt 10 pounds of iron. The computation which is the basis of the statement that 150 cubic feet of air are required to one pound of carbon burned to CO_2, assumes that coke is pure carbon, which is not the case. Coke contains only about 90 per cent carbon and is not all burned to CO_2; a great deal is burned to CO, so that the quantity of air required is only about 90 per cent of the quantity which would be required if all the coke were burned to CO_2. The result of these qualifications is that only 80 per cent of the theoretical amount of air above computed is actually needed. This 80 per cent efficiency of the air necessary is also about the ratio between the actual air discharged by a positive-pressure blower and the computed, or displacement air. The rule is therefore correct for positive-pressure blowers and is not correct for computations of the actual quantity of air needed. The tests above mentioned confirm these figures. They showed that one pound of coke would melt from 10 to 12 pounds of iron, the variation apparently being due to the difference in temperature of the iron tapped off. The conclusion is that the ratio of one to ten commonly used is reasonably correct.

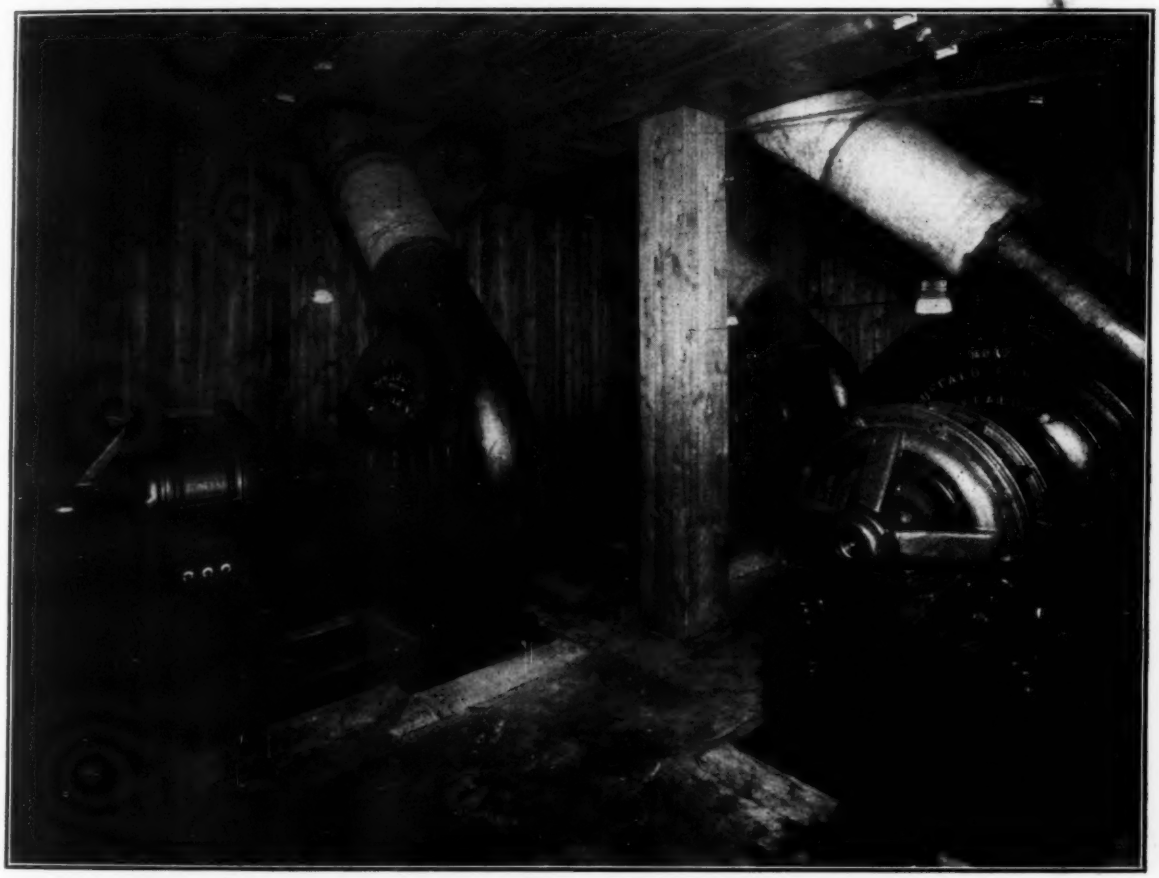
The following table gives the horsepower required for cupola blowers.

Machine.			Horsepower
Root blower	No. ¼	.....	5
Root blower	No. ½	.....	6
Root blower	No. 1	cupola 1.5 tons	7
	No. 2	cupola 2.5 tons	10
	No. 3	cupola 3.5 tons	15
	No. 4	cupola 5.5 tons	25
	No. 5	cupola 9 tons	35
	No. 6	cupola 13 tons	45
	No. 7	cupola 18 tons	60
	No. 8	cupola 24 tons	80
	No. 9	cupola 35 tons	100
Casting rattlers			2 to 12
Casting grinders			3 to 5

Lifting Magnets.

It has been estimated that the foundries of this country melt about six million tons of pig iron and scrap annually, and of this total about one to two million tons is represented by scrap iron and steel. The cost of handling this vast amount of material seems to indicate that the lifting magnet is becoming an economic necessity to foundries.

In a paper read before the American Foundrymen's Association, H. F. Stratton presented some interesting data relative to the cost of installation and operation of lifting magnets. He stated that a lifting magnet thoroughly capable of withstanding hard abuse costs about $1,300 per ton of lifting capacity of pig iron. Standard mag-



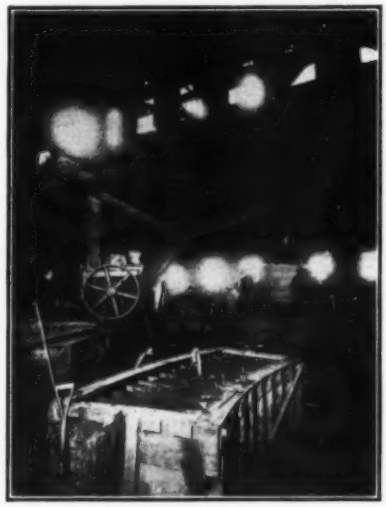
Group of Motor-Driven Blowers in Foundry.

nets are constructed in about four different sizes, and although this figure just named does not hold accurately for all sizes, yet it is a fairly close index to the selling price and is sufficiently accurate for purposes of estimate. The approximate lifting capacities of these different sizes of magnets in service are expressed in pounds of pig iron per lift as follows: 800; 1,350; 1,950; 2,400. Of course, some kind of crane is necessary for handling a magnet, and if the foundry already has its yard equipped with either an overhead traveling crane or a locomotive crane, the installation of the lifting magnet becomes a simple and relatively inexpensive matter. If it be applied to an electric overhead traveling crane, it is merely necessary to run leads from the crane to the magnet, and to provide some simple mechanism for taking up the slack in these leads as the magnet is hoisted.

Results of tests indicate that a foundry melting 35 tons of metal daily can install both a crane and a magnet, and expect a return upon the investment, after allowing all charges, of more than 30 per cent. If it happens that a foundry is already equipped with either an electric or a locomotive crane, a magnet can then be installed on a very profitable basis when the tonnage to be handled is considerably less. For instance, if an assumption be made that a foundry melts 20 tons daily, and that a magnet be installed on an existing crane, the cost of the magnet being about $900, then the cost of handling, per ton, including wages, fuel, oil and depreciation on the magnet, is about 2.3 cents, which would represent a saving in this foundry of about $924 each year, or more than 100 per cent on the investment.

Exclusive of the economies already cited, certain other incidental advantages attend the use of a magnet, and, in the summation, these would probably be quite great, and any one of them might be very important in some instance. These incidental advantages, somewhat in the order of their importance, may be mentioned as follows:

First. The elimination of labor trouble, this being particularly true where common laborers are apt to be very unreliable, as in the South, or where the demand for labor for harvesting the crops is extraordinary at certain times of the year, as in the West.



Electric Crane in Foundry.

Second. The ability of a lifting magnet to handle a drop ball for the breaking of castings too large to charge into the cupola. For this application the magnet not only serves to lift and release accurately the ball, but also to pick up and transport the broken pieces of the casting. For this particular work, not only is the matter of economy to be considered, but also the question of increased safety.

Third. The ability of a magnet to unload castings too heavy to handle by hand, and often of such shape as to be very inconveniently handled even by a crane with chains.

Fourth. The ability to stock pig and scrap in piles higher than would be possible were hand labor employed, and thereby make more efficient use of the available space in the foundry yard.

Fifth. The ability to unload cars more quickly, and thereby save demurrage.

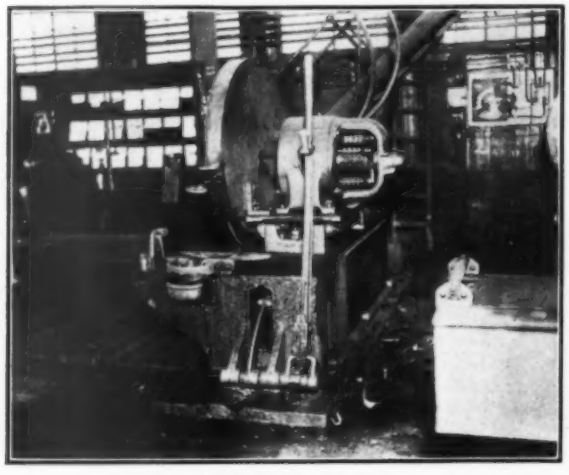
Sixth. The recovery of small pieces of iron in the bottom of freight cars, which can be magnetically swept up, but which would be neglected if the cars were unloaded by hand. This figure is considerable in the aggregate, and has been as high as several hundred pounds per car.

Seventh. The convenient recovery of nails and iron shot in foundry sand. This is accomplished by slowly passing the magnet above the sand and as close to the sand as possible, and as the magnet passes over successive portions of the ground the small iron and steel particles, mechanically associated with the sand, will break through their confinement and leap to the magnet bottom, where they will be held until the magnet is de-energized.

Foundry Lighting.

The lighting of foundries has, perhaps, been given more thought and careful attention than a great many phases of industrial illumination, particularly for the reason that a shop of this kind is one of the hardest to light. At the time of pouring and shaking out, there is always a condition of steam, smoke and dust filling the room, which makes the ordinary forms of illumination practically useless.

While no very high intensity of illumination is required for foundry work,



Motor-Driven Grinder.

Motor-Driven Blower on Platform.

Foundry Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Foundry, name withheld, does a jobbing business, repairing and making new castings for farm machinery. There are 40 men employed, working 60 hours per week. A 10-ton cupola is installed and from 5 to 10 tons of metal are poured per day.

Total connected horsepower, 110. Total number of motors installed, 4. Average kilowatt-hours per month, 4,415.

Kilowatt-hour consumption for 12 months. June, 3,610; July, 3,560; August, 3,460; September, 3,770; October, 4,040; November, 4,540; December, 4,890; January, 5,930; February, 5,350; March, 3,840; April, 4,790; May, 5,000.

Load-factor 7.2 per cent; operating-time load factor, 20.7 per cent.

The electrical energy consumption per ton of metal cast, snagged and ground is 22 kilowatt-hours.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 440 volts:

No.	Horse-power	Speed R. P. M.	Application.
1	15	1,120	Belted to 50-foot shaft (10 hangers) driving one 16-inch engine lathe; one 24-inch drill; two eight-inch double emery wheels; and one eight-inch emery wheel.
1	40	1,120	Belted to 20-foot shaft (three hangers) driving two 16-inch double emery wheels.
1	40	1,120	Belted to a three-hanger shaft driving a positive-pressure blower for a 10-ton cupola furnace.
1	15	1,120	Belted to a 60-foot shaft (seven hangers), and a 10-foot countershaft (three hangers), driving four 30-inch by 48-inch tumblers; one 36-inch by 60-inch tumbler; two eight-inch double emery wheels and one 8-inch by 12-inch air compressor, 25 pounds pressure.

The motors are all of the induction type with squirrel-cage windings.

Jobbing foundry, name withheld, does a general jobbing business handling large and small castings. From 10 to 12 tons of metal are cast per day. Sixty-five men are employed. Running hours per week, 54.

Total connected horsepower, 188. Total number of motors installed, 11. Average kilowatt-hours per month, 5,025.

Kilowatt-hour consumption for 12 months: October, 4,550; November, 4,750; December, 4,601; January, 6,000; February, 4,555; March, 4,931; April, 4,062; May, 3,170; June, 6,060; July, 5,180; August, 6,190; September, 6,260.

Load-factor, 4.9 per cent; operating-time load-factor, 17.4 per cent.

The approximate electrical energy consumed per ton of metal worked is 9.8 kilowatt-hours.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is two-phase, 60 cycles, 200 volts and 500 volts direct current.

No.	Horse-power	Speed R. P. M.	Application.
1	50	850	Squirrel-cage motor geared to a Bury 12-inch by 12-inch air compressor, 85-pound gauge, 54-inch flywheel, 156 revolutions per minute.
1	7.5	850	Squirrel-cage motor belted to a three-ton, 6-foot 7-inch by 36-inch diameter rattler.
1	7.5	1,120	Squirrel-cage motor belted to duplicate of above machine.
1	0.5	1,700	Squirrel-cage motor direct-connected to two emery wheels (one 9-inch and one 7-inch wheel).
1	40	850	Squirrel-cage motor geared to a Piqua No. 5½ L. P. positive-pressure blower, operating at 204 revolutions per minute.
1	10	850	Slip-ring motor geared to 22-inch diameter by 15-inch face drum hoist driving 1,000-pound elevator.
1	10	1,700	Squirrel-cage motor with extended shaft belted to each end of a No. 8 40-inch Buffalo cupola blower, operating at 2,740 revolutions-per-minute.
1	35	Variable	Direct-current motors driving a 15-ton Alliance crane.
1	15	Variable	
1	5	Variable	
1	7.5	1,120	Squirrel-cage motor belted to 17-foot shaft, 240 revolutions per minute, (three bearings) and two countershafts (five hangers), driving one Cincinnati vertical drill; one 12-inch hack saw; one Lodge & Shipley 14-inch lathe; one carborundum wheel.

Energy is supplied by the West Penn Electric Company.

August Anderson, Moorhead, Minn. General foundry business. Group drive. Running hours per week, 60.

Total connected horsepower, 15. One motor is installed. Average kilowatt-hours per month, 173.

Kilowatt-hour consumption for 12 months: January, 130; February, 240; March, 160; April, 150; May, 110; June, 150; July, 190; August, 150; September, 180; October, 160; November, 300; December, 160.

Load-factor, 2.5 per cent; operating-time load-factor, 5.9 per cent.

Motor Installation.

The motor installed is a 220-volt direct-current machine.

No.	Horse-power	Speed R. P. M.	Application.
1	15	1,100	Belted to a line shaft driving one mortising machine; one planer; one tenoner; one rip saw; two boring machines and one cupola fan.

Energy is supplied by the Consumers Power Company.

Foundry Data—Sheet No. 2.

American Brake Shoe & Foundry Company, Uniontown, Pa.

This plant has a daily output varying from 60 to 70 tons of cast-iron brake shoes. During normal operation 300 men are employed. Combination drive. Running hours per week, 54.

Total connected horsepower, 237.5. Total number of motors installed, 6. Average kilowatt-hours per month, 16,498.

Kilowatt-hour consumption for 12 months: January, 3,249; February, 4,789; March, 19,825; April, 20,992; May, 20,808; June 23,172; July, 11,025; August, 27,553; September, 20,353; October, 15,021; November, 16,775; December, 14,425.

Load-factor, 12.7 per cent; operating-time load-factor, 39.7 per cent.

The total electric energy consumption per ton of iron worked is approximately 10.2 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is two-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	75	850	Belted to a 60-foot line shaft (10 hangers) driving four 30-inch by 6-foot rumblers; and three 20-inch emery wheels.
1	50	1,120	Belted to a 60-foot line shaft (10 hangers) driving four 30-inch by 6-foot rumblers; two 20-inch double emery wheels, and one Quincy Iron Works 36-inch by 4.5-foot cylinder mill.
1	30	1,120	Belted to a 50-foot line shaft (seven hangers) driving one 14-inch drill press; one 24-inch double emery wheel; one 12-inch emery tool grinder; one 36-inch Fay & Egan band saw; one 16-inch engine lathe; and one 40-inch pattern lathe.
1	30	840	Geared to a Chicago Pneumatic Tool Company 9-inch by 11-inch compressor, running at 120 revolutions per minute, supplying air at 100 pounds to five Pridmore molding machines and one charging hoist.
1	2.5	1,700	Belted to a 16-inch forge blower.
1	50	1,120	Belted to a countershaft which is belted to each end of a Buffalo No. 10 blower, running at 2,220 revolutions per minute.

Energy is supplied by the West Penn Electric Company.

This foundry makes small castings and has a capacity of 300 tons per month, while the average monthly output is approximately 85 tons in two heats per week. There are 15 men employed working 60 hours per week.

Total connected horsepower, 66.5. Total number of motors installed, 7. Average kilowatt-hours per month, 767.

Kilowatt-hour consumption for 7 months with the corresponding pounds of metal worked:

Month	Kilowatt-Hours	Pounds	Month	Kilowatt-Hours	Pounds
January	600	127,080	May	930	206,680
February	620	136,640	June	940	168,930
March	620	117,010	July	760	136,360
April	900	237,990			

Load-factor, 2.1 per cent; operating-time load-factor, 5.9 per cent.

The approximate total electric energy consumption per ton of metal worked is 9.5 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is two-phase, 60 cycles, 220-volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	40	1,720	Direct-connected to a No. 11 cupola and foundry blower made by the Buffalo Forge Company.
1	2	1,720	Connected by friction drive to a 24-inch drum hoist, hauling a two-ton car up a 60-foot 20-per-cent grade.
1	10	1,120	Belted to a 20-foot shaft (five hangers) driving a 48-inch band saw; an 18-inch rip saw; a 24-inch jointer; and a 22-inch by 6-foot pattern lathe.
1	7.5	1,720	Belted to a 10-foot shaft (four hangers) driving alternately two 5-foot by 3-foot casting tumblers.
1	5	1,120	Belted to a 20-foot shaft (four hangers) driving a 24-inch drill press; a 24-inch planer; an 8-inch drill press and an 8-inch by 8-inch Curtis compressor.
1	2	1,720	Belted to a 24-inch emery wheel.

Foundry, name withheld, manufacturing car wheels, grate bars and other small castings. Three 4,000-pound heats are run each week. Running hours per week, 54.

Total connected horsepower, 9.5. Number of motors installed, 2. Average kilowatt-hours per month, 66.

Kilowatt-hour consumption for 12 months: January, 70; February, 47; March, 104; April, 54; May, 46; June 55; July, 76; August, 76; September, 83; October, 69; November, 43; December, 73.

Load-factor, 1.2 per cent; operating-time load-factor, 4 per cent.

The total electrical energy consumption per 1,000 pounds of iron cast is 1.38 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	R. P. M.	Application.
1	7.5	1,120	Motor has outboard bearing with extended shaft carrying two 5-inch pulleys each of which is belted to either pulley of a No. 4 Sturtevant blower, running at approximately 2,700 revolutions per minute.
1	2	1,710	Belted to a 20-foot three hanger line shaft which drives two drill presses (16 inches and 20 inches) and a 16-inch lathe. These machines are seldom used.

Energy is supplied by the Commonwealth Edison Company, Chicago.

the unfavorable conditions make an exacting demand on the lighting system which has practically limited the types of illuminants suitable for this service to the flaming-arc lamp, the mercury-vapor lamp and the tungsten-filament incandescent. Of course, various local conditions may dictate the use of some other type of illuminant and in fact many foundries are being successfully lighted by means of luminous arcs, but in general the types of lamps mentioned, particularly the flame lamp and the mercury-vapor lamp, have been found to meet the conditions in foundries with the best results.

Flaming-arc lamps are generally constructed so that both carbons feed down from above in the form of a "V", making a contact at the bottom. A magnet produces an electrical blowing effect which keeps the arc on the under side of the carbon tips. This accounts for the peculiar distribution of light, which is such that the maximum intensity is directly downward, while but a very small amount of light is projected upward. This makes it possible to light a large building or yard with a few lamps situated 40 to 50 feet above the ground, so as to be out of the way of cranes and other machinery. All of these characteristics render the lamp particularly adaptable to the lighting requirements of foundries.

Another feature of the flaming arc which recommends it for this work is the orange-yellow quality of the light which makes it possible for the light rays to penetrate the smoke and dust in foundries better than light rays from other arc lamps. The simplicity and efficiency of the flaming-arc lamp are now well known.

Mercury-vapor lamps are also peculiarly fitted for service in foundries and give excellent satisfaction in this service. The great amount of dust and the presence of acid fumes which arise from the operation of pouring necessitates the installation of a lighting unit that has as few moving parts in its mechanism as possible. The mercury-vapor lamp is well known for its simplicity of construction, having only one moving part which is not affected by dust. On account of the construction of this lamp care can be taken to paint the parts inside and out with a non-corrosive paint so that it will withstand any destructive fumes that may occur. Other advantages of the mercury-vapor lamp aside from its simplicity of construction, are marked economy both in power and maintenance; penetrating qualities of light rays, and the uniform distribution, eliminating shadows in molds.

Number of lamps.	Type	square feet per lamp.	Height feet.	Watts per Square foot	Maintenance cost per lamp per year.
50	HH	1250	32	0.38	$1.87
280	HH	1100	40	0.35	3.18
25	K	1500	30	0.26	2.62
26	K	1500	25	0.26	2.12
28	HH	1200	35	0.32	3.80

The accompanying table gives results of a number of installations of Cooper Hewitt mercury-vapor lamps in foundries, the maintenance costs emphasizing the economy of these units.

Commercial Practice
Management, Rates, New Business

CENTRAL-STATION ADVERTISING—HOW TO MAKE IT COUNT.

By C. A. Tupper.

In extending the lighting or commercial day load of a central station, one of the best means of preparing the way for the work of solicitors lies in the field of local advertising. At present the announcements of electric companies, in common with those of other public-service corporations, are mostly confined to rebutting the attacks of politicians or local demagogues, pointing out undue burdens of taxation, unreasonable laws or ordinances, difficulties of service, etc., or to general claims of "striving to please" the public.

Some of this class of advertising, if well-conceived and presented, may be advisable as an offset to pernicious political activity; but the public seldom takes much interest in it, and the announcements of electric light and power companies should, in general, be on an entirely different basis. That basis is merchandising.

The service which they have to offer is a commodity, the same as breakfast food, or furniture or coal. It is sold, per unit, on a certain margin of profit. The business of the company is to increase the number of units disposed of by creating a greater demand for the service.

There are many methods of doing this, and the direct use of solicitors is one of those that are practically indispensable; but the most effective and relatively the cheapest means of introducing and supplementing the work of such solicitors is through the advertising columns of the local papers.

In this advertising, to yield adequate returns, certain definite principles of merchandising must be followed. It is not enough to make general statements of readiness to furnish the service, whatever it may be, at certain rates. The announcements in the papers should contain facts of definite interest to the people of the town, whether as householders or as business men and women.

To cite a concrete case: There is a corporation in the writer's own city which operates street and interurban railways, an electric power and lighting system and a heating plant which supplies steam, through underground conduits, to buildings in the business district. Its business may be divided as follows:

(1) Lighting of streets and public buildings under municipal contract.

(2) Lighting of factories, stores, hotels and restaurants, dwellings, etc., and supplying current for irons, cookers, vacuum cleaners and other domestic purposes.

(3) Promoting use of electric signs, theater and hall dimmers and other specialties, with corresponding supply of current.

(4) Furnishing industrial power, principally electric energy for the operation of motors and heating devices used in processes of manufacturing, also for illumination of such plants.

(5) Sale of lamps, electric appliances for hotels, restaurants, stores, domestic use, etc.

(6) Sale of transformers, motors and other power equipment.

(7) Sale of steam for heating and industrial processes as in cleaning establishments.

(8) Transportation of passengers, the existing franchises not including freight.

For each of these lines there are a thousand and one ways of reaching, through the local newspapers, people directly interested or who may be interested with proper effort. Following are a few pertinent examples.

Take the matter of residence light-

ing. Many people who now use gas or lamps would be glad to have electric lights and could well afford them; but, in probably the majority of instances, they either fear the cost of the service or have an idea that the expense of the necessary wiring would be very considerable. The plan of having solicitors make calls, from door to door, for the sake of finding the home-owners who are favorably disposed towards electric lighting is a most wasteful proceeding. Even where this favorable predisposition exists in the family, it has usually been in the form of a vague wish and not talked over to any great extent. Then the wage earners of the family, who really have the deciding votes in such a matter of domestic economy, are ordinarily away, at the time of a solicitor's visit, and he can make little headway with the "women-folks" at the house until there has been some preparation. How to prepare the way is, therefore, the principal problem to be solved here.

One effective means would be to publish, say in the Saturday night or Sunday paper, for a period of weeks, views of residences of different sizes and descriptions, one at a time, with a statement to the effect that this "cottage" or "bungalow" or 8 or 10-room house had been wired complete, with fixtures, and so many lamps installed, for so many dollars. By selecting from recent cases houses where the monthly bills show fair averages for the sizes of the dwellings, and securing photographs for reproduction (naturally with the owners' permission), it could also be stated that the expense of electric lighting for the particular residence shown, was such an amount, in dollars and cents, for the preceding month. The balance of the advertisement, with the name of the public-service corporation prominently displayed, could be made to suit local conditions, but it should not contain much additional matter. Neither ought such an advertisement to be mingled with the announcements of real-estate dealers concerning their "beautiful subdivisions," but should stand out alone in another part of the paper. That is, for at least the initial campaign.

If concisely and attractively presented, this advertisement will start many family discussions and almost inevitably lead to gradual extension of the company's lighting service, particularly if systematically followed up at reasonably frequent intervals. It can also be combined to advantage, as a distinct and separate auxiliary method, with the advertisements of real-estate firms, builders and architects, where plans of houses are shown, at a fair proportion of the expense as agreed upon, and carried further afield, if local conditions warrant, into the realms of factory and store illumination, etc. In fact, the ramifications of the idea are innumerable. Its essence is to impart facts and figures which will give the public something definite to take hold of in their minds, something with which to compare previous expense and experience and to serve as a basis for consideration.

A similar line of action may be pursued with reference to extending the use of electric current for domestic household purposes other than lighting. For example, there are flatirons, curling irons, chafing dishes, cookers, coffee urns, food warmers, heating pads, foot warmers, fans, motor-driven vacuum cleaners, washers, sewing machines and other light, portable appliances of utility or luxury which are beginning to be extensively introduced in dwellings and apartment houses, not to speak of radiators, bath cabinets, etc., which have gained but a limited vogue.

Take electric flatirons. This, alone, is an excellent subject for newspaper advertising which will serve as an entering wedge for many applications of electricity in the household. The usual method of bringing it before possible users is to show a picture of a pretty girl in a frilled cap apparently flirting with someone over an ironing board. This has appended to it the announcement that irons of different shapes and sizes may be had at the address given or will be furnished on trial. Ordinarily, too, the expense of such advertising is borne by some dealer in electric specialties, whose sole return is in the small profit on sales, rather than by the electric company which will benefit most largely, and over a long period, from the increased use of the current.

The returns from advertising of the character described are, of necessity, relatively insignificant. The pretty girl ironing is looked at appreciatively by the male portion f the community; but, except perhaps for the hallroom boy who presses his trousers under the mattress, they are not moved with any yearnings to buy electric irons.

To interest the "lady of the house" it is necessary to give facts as tangible as those of the announcements made by the leading department store, where perfectly lovely five dollar linen waists will be on sale next Friday, from 10 a. m. to 4 p. m., at $3.69. The writer must confess to knowing little about the ironing of ruffles or pleats or shirt-bosoms; but, from the comments made in his own household on work returned from the laundry or executed by a laundress in the basement, it is obvious that the women have very decided views on this subject, with a range and variety of experience which is beyond the ken of a mere male creature.

It would seem, therefore, that a most effective campaign for the sale of electric irons might be carried on in the newspapers of any populous community by the presentation of facts and figures of direct interest to the housewives. For example, reference might be made to the fact that a constant heat at any desired temperature can be uniformly maintained in the electric flatiron, that elimination of cooling and the necessity for reheating saves so much time that the ordinary day's ironing can be done in a few hours, that it keeps an undesirable heating element from the house in summer, that it does away with scorching, etc.; but, above all, figures of the cost of current should be stated on the basis of the ironing for an average family. This statement should include so many flat pieces, specified as table-cloths, sheets, towels, pillow-cases, etc., so many frilled petticoats or dresses or unmentionables, so many shirts and collars, etc., and an estimate of the yearly saving from prevention of spoilage which can reasonably be deducted from the gross cost. If possible, mention ought to be made of families in different parts of the community, particularly those with well-known names, who are using or can be induced to use electric irons. As to the exact nature of the copy to be inserted in newspapers, the above details are merely given here as suggestions. In practice it should be written under the supervision of a thoroughly competent housewife who is acquainted with all of the ins and outs of domestic laundering and knows just what facts will attract immediate attention from other women having similar responsibilities.

Consider, again, electric motor-driven vacuum cleaners. There is hardly a housewife in the land who would not like to have one of these convenient auxiliaries; but the first cost and the operating expense combined seem to most of these ladies more than they want to take from other pressing necessities. Here the advertising columns of the local "home paper" can be called into service to show the actual saving in household maintenance which this device effects; i. e., the less frequent "house-cleanings" essential to a well regulated home, the greatly lengthened life and beauty of rugs, carpets, draperies, etc., from the daily quick removal of dirt and particles of sand, and other facts of similar import. Couple with these the actual expense for current with which to operate a vacuum cleaner in, say, a 10-room house, and you have a proposition which will appeal to all families who are comfortably situated.

Here, again, specific reference to well-known residences where such cleaners are used will be very useful in clinching the argument.

Where the public-service company is itself a large dealer in electric appliances and maintains show-rooms and a force of demonstrators, there is added incentive for the right sort of local advertising; but the main thing to keep in mind should be the extension of the use of current. Hence, attention can be concentrated upon that purpose and the sale of the apparatus made only incidental. Personally, the writer would favor leaving this to dealers, if the latter will be content with moderate profits, and securing their active co-operation in the campaign along lines which are demonstrated to be of mutual advantage.

It should also be borne in mind by both the managers of public-service corporations and the business managers of newspapers that this class of local advertising will have a powerful auxiliary in the nation-wide campaigns which have been entered upon by large manufacturers of electrical appliances in advertising (1) to local dealers through the trade press and (2) to the public at large through the popular magazines. The facts in regard to these campaigns are so well known or can be so readily ascertained that they require no extended mention in this article. As an element in the success of local sales-effort, however, their influence should have due consideration, in order to make this dovetail as effectively as possible with the appeals made in newspaper copy.

One reason why this fertile field of advertising in the daily press has remained almost uncultivated is the fact that the more aggressive electric service companies have been diverted from it by the publication of their own papers, some of which have attained enormous circulations by being mailed or distributed gratuitously to the people of the communities in which they are operating. This method of direct appeal has, undoubtedly, shown results; but it is the writer's opinion that, for the same expenditure of money, much more could be done with displays in the local newspapers.

This is, however, a case where the managements of the latter have literally been "asleep at the switch." They have not only made little or no effort to prevent the shunting away of this profitable business but appear to have been actually ignorant of its possibilities. Instead, they have made frantic efforts to secure the class of advertising which public-service corporations have come to regard as a necessary evil, with the idea merely of "protecting" themselves, which they frankly regard in the same light as blackmail and which they curtail or cut off just as much as they dare.

Advertising which is done on the basis of merchandising is an entirely different proposition. When demonstrated as an asset instead of a burden, it will be considered as indispensable in the business of a public-service company as in that of a dry-goods store. The two can be put and maintained on precisely the same plane, so far as productiveness is concerned.

It is therefore "up to" the business managers of newspapers to study the situation in their respective localities and make an intelligent effort to realize its possibilities. The public-service corporations, themselves, cannot be depended upon to take the initiative. It is a recognized fact in every field of advertising that the benefits of any particular line of action have to be conceived by someone connected with the advertising media, or the agencies working in conjunction with them, and repeatedly urged upon the attention of the prospective advertisers.

In the above discussion there have been touched upon only a few phases of the general subject; but the same ideas can be applied to the systematic extension of other branches of public service under corporate control, including many that have not been mentioned. The use of electric current for industrial power, heating and illumination offers a subject which, from the writer's experience in the sale of electrical apparatus, can be made especially fruitful in suggestions for newspaper advertising. This is to be embodied in a later article which will also show the effect of such effort, properly directed, upon the total volume of business derived by the local papers from the commercial enterprises of the city and its cumulative benefit to all concerned. The best opportunity for starting a successful advertising campaign is, however, in the domestic and mercantile fields; and this can be made the basis of more extended effort on the part of the daily papers and the public-service companies, in co-operation, to develop to the fullest extent the opportunities latent in any live community. Isn't it worth trying?

Electric Power for Building Construction.

In constructing the $1,000,000 city hospital in Louisville, Ky., the contractors, A. Bentley & Sons Company, are making extensive use of electric power from the central station. A saw mill has been installed for the purpose of cutting lumber to dimensions for use in the concrete work; also a temporary machine shop and blacksmith shop.

Intensive Power Cultivation at Kansas City.

The Kansas City Electric Light Company's sales department has just completed a novel and successful campaign for new business. Early in January it was decided to send to the National Electric Light Association Convention in Seattle the salesman who should score the greatest total of points as authorized in a schedule adopted, these schedules being so arranged that every man had a chance to win at least some points each month. In this way the men were encouraged to secure new business and the total of small contracts shows the results. Each month comprised a separate competitive period and the points secured by each man were carried forward to be added to subsequent winnings. In four months 345 power contracts were secured, totaling 8,321 horsepower, these contracts being divided as follows: 281, 10 horsepower and under; 44, 11 horsepower to 50 horsepower; 10, 51 horsepower to 100 horsepower; 4, 101 horsepower to 200 horsepower; 6, 201 horsepower and over.

The winner of the prize secured 38 contracts totaling 2,332.5 horsepower.

The competition was keen up to May 1, and one of the gratifying results was the development of the "closing" ability in the different engineers.

The company is so well pleased with the results obtained that it has added an additional engineer to the department and also furnished an automobile for the exclusive use of the salesmen.

Rates Reduced in Columbus.

The maximum domestic rate for electric current in Columbus, Miss., has been reduced to 12 cents per kilowatt-hour by the Columbus Railway, Light & Power Company. It was formerly 17 cents. The city will pay $80 instead of $90 per lamp per year for street lighting.

Lower Rates in Los Angeles.

Upon July 1, next, a lower schedule of rates will go into effect in Los Angeles. The rate for residence lighting will be reduced from 7 to 6.5 cents, with a minimum charge of 75 cents instead of $1.00.

Boston Electric-Vehicle Parade.

The Electric Vehicle Club of Boston, Mass., held its second annual parade on May 30 and had 125 vehicles in line. It constituted a practical demonstration of the growing popularity of the electric vehicle for business use.

Day Baker, president of the Electrical Vehicle Club, was chief marshal and rode at the head of the line.

Electrical Construction

WIRING AND MOTOR INSTALLATION IN A LARGE MACHINE SHOP.

By Guy R. Grove.

The products of the David Bradley Manufacturing Company have been on the market for over fifty years and are well known. The factory is located at Bradley, Ill. The plant covers approximately forty acres of ground and is said to be the largest factory in the world devoted exclusively to the manufacture of farm implements and selling them direct to consumers.

Two years ago the power equipment consisted of a Vilter non-condensing Corliss engine rated at 400 horsepower. This engine was located in a room adjoining the main machine shop and was belted to a 5-inch line shaft running the entire length of the shop. The boiler equipment consisted of six 100-horsepower units. The electrical equipment consisted of two generators, one a 150-kilowatt, three-phase, 60-cycle, 220-volt generator and one 50-kilowatt, 125-volt, compound-wound, direct-current machine. These machines were installed in a dynamo room adjoining the engine room and were belted to the main shaft. The 150-kilowatt machine was used for supplying energy to motors for driving machinery in remote parts of the factory. The 50-kilowatt direct-current machine was used for lights throughout the factory, of which 60 were constant-voltage arcs, and 400 carbon lamps. A five-panel marble switchboard in the dynamo room served for a controlling and distributing board. The plant was purchased about two years ago by Sears, Roebuck & Company, and they decided to make this their main plant for the manufacture of farm implements and to immediately install machinery for doubling the capacity of the plant. From the foregoing general description of the old equipment it is easy to see that a very radical and comprehensive change of power system was necessary. Not only was the old system inadequate to meet demands for extensions, but it was inefficient as to light distribution and power transmission, as probably thirty per cent of the power generated was lost in the thousands of feet of line-shafting and belting. Electric drive from central-station service was therefore decided upon in preference to installing new engine and boiler equipment.

The problem of laying out the motor drive for such a large plant having so great a variety of machinery was a difficult task. This work was put in charge of the company's mechanical engineer, Theodore Wachs. Fig. 1 shows the general layout of the factory buildings and various departments. In changing from steam to electric drive time did not permit them to rearrange the machinery on the floor for the most economical method of drive.

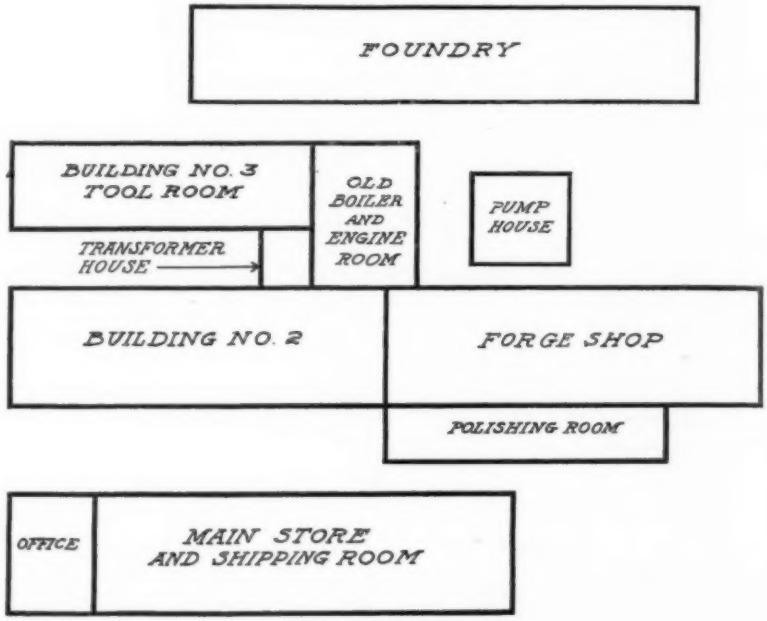


Fig. 1—Plan of Building.

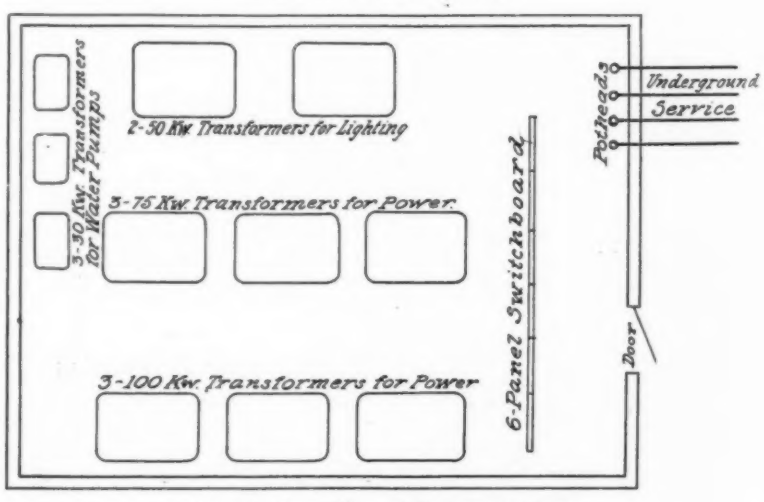


Fig. 2.—Floor Plan of Transformer Room.

The main line-shaft was divided into several sections and each section belted to a motor suspended from the ceiling. These motors range in size

from 10 to 30 horsepower, as 30 horsepower was considered the maximum size for economical group drive. Later these machines were rearranged for more economical drive, some of them being provided with individual motors.

Three-phase, 220-volt, squirrel-cage induction motors are used throughout the factory. All motors above 7 horsepower are provided with starting compensators, and the large sizes with low-voltage release for protection in case voltage goes of the line long enough to stop the motor and comes on again before an attendant has time to throw the starter handles in the "off" position.

Fig. 3.—Motor Installation in Polishing Room.

Fig. 4.—View in Forge Room.

Service and Transformer Room.

One very interesting part in this installation is a modern brick and steel fireproof room for housing the service transformers and switchboard. The building is 20 by 25 feet in size with 10-inch walls of brick, and a steel roof. The room is built in a 20-foot space between two of the factory buildings.

The service is 4000/2300 volts, 60-cycle, four-wire, three-phase, and is brought from service potheads on the street to the transformer house through four 1/0 lead-covered cables laid in four-duct vitrified-clay conduit underground. A manhole is built at the street entrance and also just outside of the transformer house, where it is taken inside through rigid steel conduit and terminates in four disc potheads.

Fig. 2 is an outline of the floor plan of the room. The service is controlled by a hand-operated oil switch located on one of the panels on the board, from which a separate circuit goes to each bank of transformers. The 75-kilowatt and the 100-kilowatt banks are operated in parallel for power.

The switchboard is made up of six panels, one totalizing panel for indicating and recording meters for light and power, two for branch lighting circuits and three for power circuits. All the circuits in the room are placed in clay-conduit work.

Two 50-kilowatt transformers are used for supplying 110 to 220-volt three-wire service to 2,200 carbon and tungsten lamps in service throughout the shop. Each department and floor has its own lighting feeder, which, as well as the power feeder circuits, is taken out of the transformer house through clay conduit.

There are six separate departments using motor drive; namely, tool, machine, forge, woodworking, foundry and polishing rooms. Labor-saving devices and machinery are used in every department where possible, and apparently no expense has been spared to make the shops and equipment the best and most modern in every respect.

Motor Equipment.

The drive in the tool shop is confined to individual drive on machines not used much and on special machinery, and group drive on machines used continually or frequently, such as lathes, shapers, small planers, drill presses, etc. The motor data sheet gives the numbers of motors and drives used in this department.

The three main buildings, which are the principal buildings, are of substantial brick construction with wooden floors and trusses and are three stories high. The machine shop occupies the entire ground floor of building No. 2.

The machines are of small size and those doing similar work are placed two together and driven by group drive. The motors in this department are all suspended from the ceiling, and range in size from 10 to 30 horsepower. Where speed change is required it is obtained by cone pulleys, although they are equiping more machines every day for individual drive. No adjustable speed motors are used.

The total connected load in the foundry department is 123 horsepower. The table gives the sizes and loads. Motors are used here wherever possible to eliminate manual labor. An exam-

ple of this is a revolving-cylinder screen driven by a five-horsepower motor. This screen is used to clean the sand which is shipped in on cars for building cores used in molding castings. This work is usually done by hand.

Group drive is used for operating double-spindle emery wheels for grinding rough castings. Three of these machines, an exhaust fan for removing emery dust from the wheels and four two-ton tumblers are driven in groups by a 30-horsepower motor. These tumblers are driven by means of pinion gears in the usual way. A 30-horsepower Crocker-Wheeler motor is belted to a flywheel-type air compressor. The air is compressed to a pressure of 60 pounds and is piped to all parts of the molding room where hose are attached to suitable connections on the pipe line for driving tampers for packing molds. This is another improvement not found in all foundries.

The larger-sized motors in this department are mounted on substantial frame platforms built along the wall and approximately eight feet from the floor. The smaller-sized motors are suspended from the ceiling.

The forge room and blacksmith shop is the largest and most important department in the factory. This shop is in the rear of the machine shop. The building is approximately 100 feet wide and 300 feet long and one story high. The room is well provided with windows and ventilation.

Owing to the great amount of wear and tear on farm implements, such as plow points and shares, they must be well constructed of the best grade metals and properly tempered and hardened. Only the latest and best methods are used here for this purpose. As stated before, few parts used in the construction of farm implements need machine work, nearly all of them being formed or hammered out in this department and finished on emery wheels.

The ovens used for the heating of the iron which is necessary for pounding it into the desired shape are heated with crude oil in the usual way. The oil is stored in a steel tank which has a capacity of 20,000 gallons. The tank is located just outside the forge room and placed underground, which allows the oil received in car-load tanks to drain directly into it. A house is built above the tank in which is installed a three-horsepower Triumph motor, belted to two Blackmer's rotary oil pumps. These pump the oil from the tank direct to the ovens in the forge room through a suitable system of piping.

The motors used in this department are mainly for group drive and their size and load are given in the table. They are all of the squirrel-cage type and are bolted to a frame platform built along the side of the room as shown in one of the cuts. The picture also shows two one-ton drop hammers for forming plow points.

The machines used in this department are mostly limited to drop and trip hammers, punch press, and machines for shaping heavy pieces of iron, which are generally called "bulldozers." These bulldozers are driven one or two in group with other machines. This arrangement allows the motors to be operated to about full capacity by the other machines, as the power required by the bulldozers is of only a few seconds' duration and does not overload the motors long enough to affect the drive. This scheme is more satisfactory than putting them all on one motor, which at times may have but the friction load and at other times a load of two or three times its rated capacity, if, for instance, they should all be operated at once.

A 50-horsepower Crocker-Wheeler motor is also used in this department for driving a flywheel type of ammonia compresser which is used for cooling purposes in connection with tempering metals. For this purpose specially prepared oil is cooled in a tank to a temperature of 40 degrees Fahrenheit by the usual method and the parts to be treated are taken out of white-hot ovens and thrown into the oil. A two-horsepower Triumph motor is belted to a pump for keeping the brine in circulation.

Fig. 3 shows a 50-horsepower General Electric motor in the polishing room where the plow points are polished. This motor drives an exhaust fan for carrying away the emery dust from the wheels, and four two-spindle polishing machines. Two 20-horsepower motors are also used for driving woodworking polishing machines.

Group drive is used in the woodworking department, as the machines are small, the only exception being a No. 8 Morgan nailing machine as shown in Fig. 5. This picture also shows the method of wiring the motor circuits in conduit in all places in which there is inflammable material. A great variety of woodworking machines are found here, as they have a machine built especially for making all wooden parts used in connection with their products.

The largest motor used in this department is a 40-horsepower machine mounted on the floor and belted to a 30-inch planing-mill exhaust fan which collects all the residuals and carries it through a 12-inch galvanized tube to a bin in the boiler room where it furnishes enough fuel for operating a 100-horsepower boiler.

The woodworking shop is located on the second floor above the machine shop and a great many planers and shapers are driven by the line shaft in the machine shop, by belt drive through the floor.

MOTOR EQUIPMENT AND LOAD.

Number	Horsepower	Speed	Method of Drive	Load
1	1	1200	Belt	Stamping machine.
1	5	1200	"	Brown & Sharpe No. 2 Universal milling machine.
1	7.5	850	"	Thirty-inch disk grinder.
1	10	900	"	Line-shaft driving lathes, planers, etc.
1	10	570	Direct	Clark and Hill planing mill.
1	5	850	Belt	Single-cylinder sand cleaner.
1	3	1120	"	Elevator for lifting ore.
1	3	1120	"	Two Blackmer's rotary oil pumps.
1	7.5	850	"	Two small tumblers.
2	15	850	"	Tumblers.
1	25	1700	"	Blast fan for cupola.
1	30	900	"	Shaft from which are driven five tumblers, three 14-inch double-spindle emery wheels and one 24-inch exhaust fan.
6	10-30	900	"	Line-shafting.
1	30	900	"	Air compressor for foundry.
1	15	1200	"	Plow-point shaper.
1	30	3600	Direct	Forge blast blower.
3	30	900	Belt	Shafts from which trip-hammers, punch-presses, bulldozers, etc., are operated.
1	25	900	"	Multiple punch-press for heavy work.
2	20	900	"	Four 2-spindle polishing machines each.
1	50	720	"	Four 2-spindle polishing machines and one 30-inch exhaust fan for polishing machines.
1	50	720	"	Ammonia compressor for cooling oil in tempering metals.
1	2	1120	"	Brine-circulating pump.
1	5	1200	"	Saws, planers, etc.
1	3	1700	"	One Morgan No. 8 nailing machine.
1	7.5	1200	"	Planers, shapers.
1	15	850	"	One 7-spindle and one 15-spindle gang boring machines.
1	40	1200	"	One thirty-inch exhaust fan for removing residuals from room.
4	5-20		"	Elevators.
2	7.5	680	Direct	Vacuum pumps used in heating system.
1	30	1173	Belt	Deep-well pump.
1	100	1173	Direct	Fire pump.
1	2	1200	"	Pipe cutter.

The plant operates its own pumps by motor drive for an extensive waterworks system for factory purposes and fire protection. The pump house, which is substantially constructed of brick and steel, is built separate from the other buildings and far enough away so as to eliminate any possible chance of a fire in any building interfering with the operation of its pumps. The equipment consists of a deep-well pump having a capacity of 200 gallons per minute belted to a 30-horsepower motor of the slip-ring type. The water is pumped from the deep well into a 10,000 gallon steel tank placed underground and under compression enough to force the water to all parts of the factory. The water wasted at 30 flowing drinking places located in all parts of the factory is allowed to drain back into a 50,000 gallon reservoir built underground and near the pump house.

Located in the pump house is a four-stage rotary fire pump which gets its supply of water from the 50,000-gallon cistern through an 8-inch pipe. This pump has a capacity of 1,000 gallons per minute at 100 pounds' pressure. The fire pump is also used for keeping a 150,000-gallon standpipe full of water, which furnishes the water pressure for an automatic sprinkler system. To eliminate any chance of the cistern becoming dry during a fire, the cistern has a supply pipe line from the standpipe, city water mains, and also from the deep-well pump.

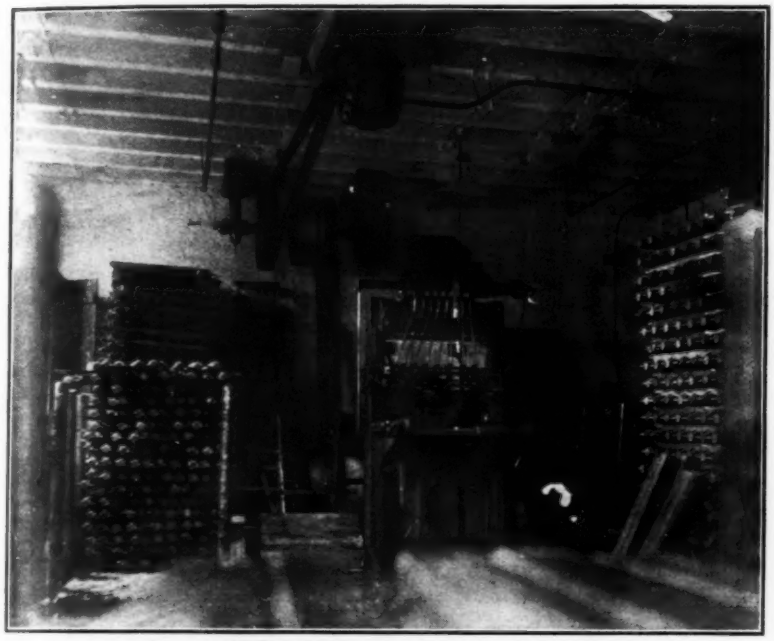


Fig. 5.—Showing Wiring to Motor Driving Nailing Machine.

Fig. 6.—Starting Circuit of Motor Driving Tumblers in Foundry.

The fire pump is driven directly by a 100-horsepower Triumph slip-ring three-phase motor, which is supplied by its own feeder and the bank of 30-kilowatt transformers in the service room. The feeder is placed in Orangeburg fiber conduit laid underground. This is highly desirable as it gives no possible chance for a fire to cut off the service.

The wiring for power and lighting circuits is at present nearly all knob and cleat work, except where the wires are exposed to mechanical injury or dampness; here they are in conduit. Separate circuits for power are run from the distributing board to the various departments. The motors in the forge and polishing rooms, which aggregate 300-horsepower, are supplied by a circuit of 1,250,000-circular-mil stranded cable, rubber covered. In other departments the circuits are run on the ceiling through the room, as near the "center of gravity" as possible, and branch mains taken off through fuse and switch to the separate motors. In the woodworking shop the wires are in conduit.

The wiring in the foundry and forge room is of triple-braid slow-burning wire, which does not deteriorate by the continued high temperatures which are found in these departments.

Three-wire service is carried to all departments for lighting purposes and each department has its own mains running from the transformer house through the center of the room. The block system of lighting is used in most of the departments with individual carbon lamps for detail work where they are required. In the forge, polishing and shipping rooms five light clusters with enameled reflectors are in use for general illumination. Where the block system is used the lights are placed in squares 20 feet apart. Branch circuits are taken off the mains running through the room and carried to a distributing panel located on the side walls, within reach from the floor. Each panel controls 36 lights, by six circuits of six lights each controlled by snap switches and protected by fuses in the panel box. The panel boxes are all made of iron and conduit is used to carry the wires from the ceiling to the box, which gives the wires ample protection from mechanical injury. The circuits for detail lamps are separate branch circuits and controlled by sockets at the lamp. Carbon and tungsten lamps are used for general illumination.

Fans for Window Dressing.

Dealers in electrical supplies report that a demand for electric fans covering twelve months instead of only the summer season, has been developed and is growing so rapidly as to be a considerable factor in the sum total of fan sales. It is for use for advertising purposes, that is to say, for the creation of novel effects in window displays. The electric fan has always been used more or less in this connection, but those interested in the science of window trimming have discovered that a moving display is a hundred per cent more effective than an exhibit that is not in motion. As the electric fan provides sufficient impetus for most purposes, it immediately fitted into the scheme of the expert window trimmer; and there are few large retail stores which have not occasion to use an electric fan for purposes of this kind rather frequently.

For example, a florist who desired to secure an unusually novel effect in connection with an elaborately trimmed window suspended a number of doves from the ceiling of the window by invisible threads. Two concealed fans were put in operation, and provided sufficient air current to keep the doves swaying gently to and fro without cessation. The window, it may be said in passing proved a veritable sensation, and it is safe to say that the idea will be worked with variations by many another store. The point of the story is that the dealer in electric fans need not regard this important appliance as suitable only for use during the heated term, as it is evident that with a little intelligent effort he can build up a large and profitable business from the side line of window trimming.

Grounding the Neutral in a Three-Phase System.

A writer in *Electricity* who claims to have had extensive experience in the operation of electrical apparatus in mines is a strong advocate of the grounded neutral in three-phase work. He points out that when the neutral is grounded properly the maximum voltage to earth of any phase is only 58 per cent of the line voltage, and that the danger from electric shock is therefore greatly reduced. Also, leakage tripping devices can be conveniently used, which will switch off the supply when a ground occurs on any phase, leakage of current to earth thus resulting in automatic isolation of the defective circuit.

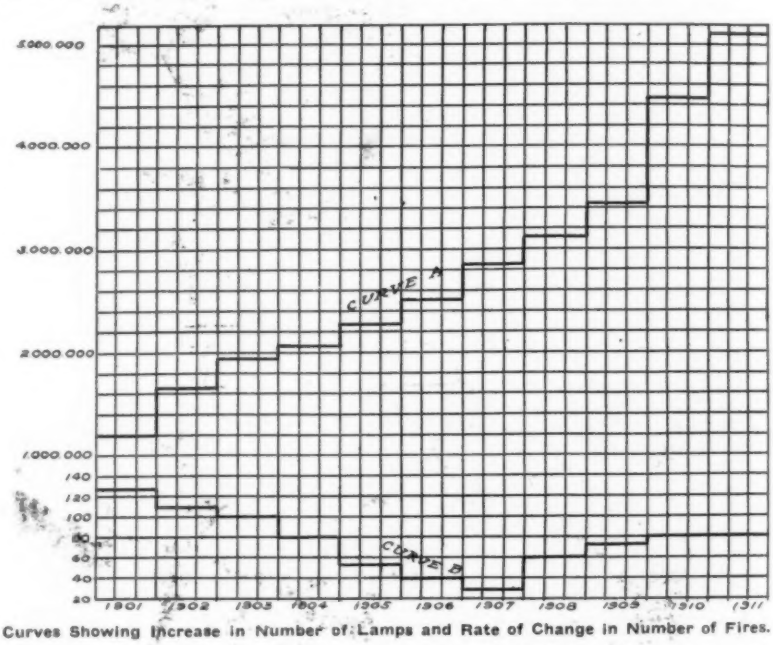
On a grounded system the risk of fire from a momentary short-circuit to ground is considered very much less than from the leakage which may go on if the neutral is not grounded.

Decrease in Number of Electrical Fires in Chicago.

The accompanying curves show graphically the relation between the increase in the use of electricity in the city of Chicago during the past ten years and the variation in the number of fires found to have been of electrical origin. It is thought that the increase in the use of electricity has been approximately proportional to the increase in the number of incandescent lamps. Curve *A* shows how the lamp load has grown, while from Curve *B* the number of electrical fires in any year within the given period may be read off.

It will be noted that the number of incandescent lamps in use within the city has increased steadily from a little more than a million in 1901 to something over five millions in 1911. On the other hand, the electrical fires decreased in number from about 130 in 1901 to less than 40 in 1907, after which there was a gradual increase until 1910, the number of fires in 1911 being about 80. Curve *A* shows that the gain in number of lamps in use from 1907 to the present has been very rapid, while from Curve *B* it is seen that the increase in the number of fires during this period has been comparatively small. It is especially noteworthy that during the very great growth in the number of lamps which has come about within the past three years there has been practically no increase in the frequency of fires started by electricity.

In collecting these and other data, all of which will be incorporated in the next annual report of the City Electrician, which will soon come from the press, the Department of Electricity discovered that there were 31 fatal electrical accidents in Chicago last year, as compared with 13 which proved fatal the preceding year. It is found that these accidents were confined largely to electricians and to persons not twenty years old. The first, it is thought, suffered on account of carelessness, usually, and the others from ignorance. The Department will suggest that instruction as to the cause of accidents of this nature should be given in the city schools.



Curves Showing Increase in Number of Lamps and Rate of Change in Number of Fires.

Care of Motor Bearings.

After a motor has been running several months the oil in the bearings becomes thick and heavy and tends to retard the free traveling of the rings. This thick oil should be taken out frequently and the bearings thoroughly cleaned.

I have found the following plan a very quick and satisfactory one, and can recommend it.

Remove the plug at the bottom of the bearing, letting the old oil out; replace the plug and fill the bearing with gasoline, then start the motor and let it run about a minute, being very careful not to run it long enough to cause the bearing to heat. When the plug is removed you will find the gasoline will be very dirty.

This operation should be repeated as many times as the condition of the bearings require, or, in other words, till the gasoline comes from the bearings comparatively clear. You may be sure then that the bearing is clean, and that it is ready to be filled with new oil.

W. A. Hines.

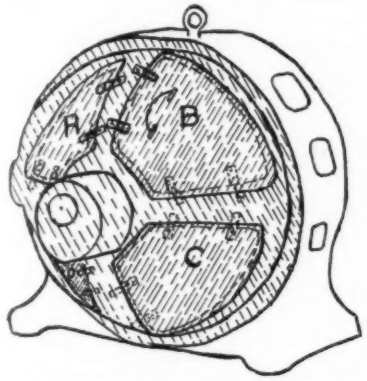
PROVIDING SUBSTITUTES FOR INCLOSED MOTORS.

By H. G. Wilson.

A better understanding would sometimes be attained between customers, manufacturers and the insurance interests if salesmen in selling electric motors and the like for special work would recommend that which will not conflict with National Code rules.

Open-type motors are more often found than otherwise in dusty places such as wood-working plants, flour mills and grain elevators; also in factories making paints and other articles from which inflammable gases are freed. Investigation has shown that the owner bought frequently just what the salesman recommended.

Makeshift arrangements are often used, such as asbestos or tin-lined wooden boxes having screened ventila-



A Method Employed When a Standard Inclosed Motor is Not Available.

tion openings and glass-covered inspection openings. It is questionable whether any benefit is derived therefrom, as enclosing an open-type motor results in poor ventilation and usually an accumulation of oil-soaked dirt inside the box. Metal boxes have been used, too, giving better satisfaction, because of the better heat-conducting quality of metal as compared with wood, but the dirt accumulation remains unchanged. These boxes generally have angle iron framing covered on top, bottom and sides with strong galvanized sheet-iron, provided with screened ventilation openings and glass-covered openings for inspection. Another scheme which is used to better advantage than either of the above is the inclosure of the commutator end alone, by a galvanized iron hood thus eliminating the heating and the dirt accumulation. It can be fastened to the different makes of motor frames in a variety of ways. All designed with the idea of an easy and durable means for frequent inspection. The illustration shows one of many ideas successfully used. In which A, B, C, and D are galvanized coverings, lapping over the edges of motor framing about one inch. It is understood, of course, that this is not recommended in place of a standard inclosed-type motor.

Meeting of Illinois Contractors.

The Electrical Contractors' Association of the State of Illinois will hold its next semi-annual convention at Rock Island, June 14 and 15. At this time the report of the committee appointed five months ago to arrange a definite plan of campaign for the better education of electrical contractors throughout the state in the matters of cost-keeping and estimating will present its report and there will be much other important business. The prospects are ,in fact, that this will be one of the best conventions the Association has yet held. E. E. Gibson, 421 Powers Building, Decatur, is president of the Association and N. M. Blumenthal, 179 West Washington Street, Chicago, is the secretary.

Among the Contractors.

The Pierce Electric Company, 335 West Madison street, Chicago, is wiring two large buildings for Thomas Balmer, on Kenmore avenue, Chicago.

Metz and Berg, the electrical contractors of Marysville, Cal., are installing two 75-horsepower motors for pumping purposes on the irrigation project of the Richvale Land Company, at Richvale, Cal.

The Churchill-Warner Company of Roseburg, Ore., has been awarded the contract for the electrical work to be done on the new Roseburg Grammar School. Work is expected to begin on the wiring about July 1.

The Emmons Electric Company, 118 North La Salle Street, Chicago, is installing the electric wiring in a new building erected by John A. Orb in that city.

The Redding Electric Company, of Redding, Cal., is installing a complete 1200-horsepower electric-power plant, including five and a half miles of transmission lines, for the Trinity Dredging Company in Trinity County, Cal.

The Southern Oregon Electrical & Heating Company, of Medford, Ore., has done a large proportion of the electrical work that has recently been done in that city. Included in these installations was that of the ornamental street-lighting system in the center of town, this company both putting in the system and manufacturing the ornamental posts used. D. C. McAlpine, who is manager of the company, has had a wide range of experience in the electrical field.

Charles G. Rush & Company, 136 West Lake Street, Chicago, has secured the contract for the electrical work in the new additions now being made to the buildings of the Morse School of Chicago.

L. K. Comstock & Company, 38 South Dearborn Street, Chicago, is putting in an installation of 600 incandescent lamps and 12 motors for Sears, Roebuck & Company, at 901 Homan Avenue, Chicago.

O. C. Henlein, who acquired the business of the Electric Construction Company in Medford, Ore., moved his place of business on May 1 to 318 East Main Street. Mr. Henlein was formerly in the electrical-contracting business in Seattle, Wash.

The electrical-contracting establishment of the Electric Wiring Company and of B. M. Bush in Grants Pass, Ore., were recently acquired by A. H. Noyes, who has merged the two at 111 South Sixth Street of that city. Mr. Noyes was for two years connected with the sales organization of the Electric Appliance Company, traveling from that company's San Francisco office.

LETTER TO THE EDITOR.

Fishing Wires in Partitions.

To the Editor:

In your March 23 issue, in the Dollar Wiring Kinks is one by J. D. Craig on "Fishing Wires in Partitions." I should like to ask Mr. Craig why he uses loom at all in such a case. It is wasting material unless the walls are of fireproof construction. Why not use a conduit? One conduit will take both wires and will make better work at no greater cost. Besides loom does not comply with the rules which calls for fireproof insulation, "such as glass or porcelain."

F. E. James.

Green Bay, Wis., May 30, 1912.

Montana Coal Production.

The production of coal in Montana in 1911, according to Edward W. Parker, in a statement just issued by the United States Geological Survey, was 2,975,358 short tons, with a value of $5,339,058.

Hard Rubber From Cotton.

It is stated that tests recently made in Philadelphia indicate that waste cotton can be converted into a serviceable substitute for hard rubber by a process thought to be practical.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Fastening Conduit Boxes.

A method that I have always found to be a practical and sure way of fastening conduit boxes on a concrete form is indicated in the accompanying figure. This method reduces to a minimum the chances of the box being set out of plumb after the concrete is poured. The nuts and washers can be taken off

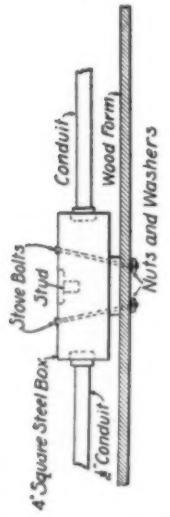


Fig. 1.—Method of Fastening Box.

when the forms are taken down and the bolts can be cut out of the box, leaving the latter set plumb and flush with the ceiling.

Albert Roscoe.

Fishing Conduit.

In fishing wire in conduits when other schemes to get the flat steel snake wire through the pipe failed me, I have sometimes saved the day by soldering a little ball of lead solder, about a quarter of an inch in diameter, on the hook at the end of the snake, leaving part of the hook exposed. In the open part of the hook not covered with lead I tie a couple of loops of twine. The theory applying to this is that the flat edge at the end of the snake tends to catch in the space in an elbow where the pipes do not butt together; but the ball on the end of the snake makes the latter slide over the joint in the pipe without catching. If the snake still fails to go all the way through the run of pipe, another snake with an open hook is introduced at the other outlet, and, passing the ball of lead, the hook on this when pulled back catches in the cord on the first snake, and pulls the latter safely through, so that the wire can then be pulled in.

H. Piccard.

Control of Hall and Stairway Lamps.

This subject is by no means a new one. Experience has shown, however, that there are many wiremen who are not familiar with the best methods of wiring for the control of lamps on stairways, and in other similar places; and it is for this reason that this explanation of the matter is offered.

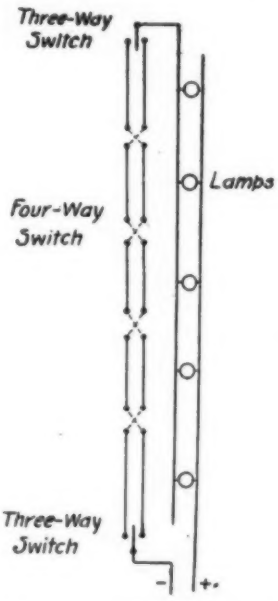


Fig. 2.—Arrangement of Switches and Lamps.

The connections for a set of hall lights and switches are shown clearly in Fig. 2. Two three-way switches are used, one at lower landing and one at top landing; and at each additional landing a four-way switch is used. The switch at the lower landing should be placed just inside the entrance door; and the switches on the above floors as near as possible to the doors leading to the different flats. The number of lights used is optional; however, it it advisable to install one on each landing and one over the center of each flight of stairs. The lamps can be 16 candlepower or more, because the energy used is very small considering the short time that the lamps are lighted. A person coming upstairs can turn the lights on by turning the switch in the vestibule, and turn them off at any one of the landing switches. This can be repeated by a second person coming up or down. In short, the lights can be turned on or off by any switch at any time. This system can be used with large lamps cheaper than a set of small lights burning continuously.

W. C. Lockwood.

Quick Way of Inserting Ammeter.

A very convenient connection for making ammeter tests in a shop having a large number of motors is as follows.

If an ammeter having a separate shunt is used, take a burned out cartridge fuse, of whatever style is used as standard, and remove the contents of the fiber tube. Then solder the ferrule securely to the knife contact, and fasten the shunt to the fuse terminals. The small cord leads usually used on an ammeter can now be fastened to the shunt, and by pulling one fuse out of a two-wire motor circuit and inserting this connection, the ammeter can be inserted in the circuit almost without

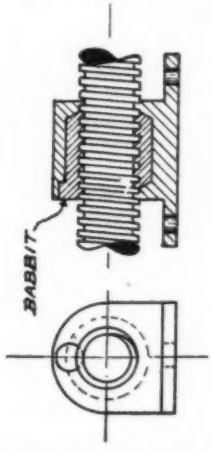


Fig. 3.—Nut with Babbitt Lining.

stopping the motor. The ammeter can be held some distance from the machine and there are no heavy wires and heavy temporary connections to make. In using an ammeter with self-contained shunt the same arrangement could be used except that heavy wires of sufficient carrying capacity for the load would have to be used.

Roy W. Eves.

Repairing a Nut.

It sometimes happens that a threaded hole gets so warm that the screw will not fit, or that by accident the hole is drilled too large for tapping. Such defects can be easily remedied by the simple expedient suggested in Fig. 3. The hole is counter-drilled or turned and babbitted.

L. Strastny.

Among the Supply Men

Co-operative Credit Protection.

Frederic P. Vose, of Chicago, general secretary of the National Electrical Credit Association, was invited to address an open meeting of the electrical manufacturers and jobbers at the convention of the Electrical Supply Jobbers' Association, on the afternoon of May 23, at Hotel Chalfonte, Atlantic City. Mr. Vose had not prepared a written address, but some of the points covered by him on that occasion were, in substance, as follows:

"Among the first definite efforts made by the electrical trade in the United States to bring together the electrical manufacturers and jobbers for the purpose of promoting a more cordial feeling among them, to protect their mutual interests and to secure uniformity and certainty in the customs and usages of the electrical trade and commerce, there was inaugurated 17 years ago at Philadelphia what was then known as the Electrical Trades Association of Philadelphia, followed shortly by similar organizations in New York, Boston and Chicago and seven years later in San Francisco.

"By reason of the friendly and confidential relations thus established, the Eastern and Western branches of the Jobbers' Association and of different Manufacturers' Associations were brought into being two or three years later. By that time the representative and influential members in the trade had become convinced that co-operation was the religion of the electrical industry; that competition reduced profits, whereas co-operation multiplied profits; that it was unwise and unprofitable to spend good money for the trade of doubtful customers, and commercially suicidal to compete in bad debts.

"It was long ago recognized that all alert sales managers should keep themselves informed as to the general condition of their bills and accounts receivable, and learn definitely the habits of payment of their customers. For, while a customer might be responsible financially, nevertheless, if the goods were sold to him at a price based on 30-day terms and the customer took from 90 to 120 days or longer to settle, such action meant added cost of the goods sold, resulting in a reduction of profits.

"Salesmanship was defined as the disposing of goods at a profit to a responsible customer on a written order signed by the customer in his correct, legal name. Credit granting is the reposing of faith in the purpose and ability of a customer to meet his future obligations according to their terms. The question for the sales manager, as well as the credit manager, to determine is: Does the customer possess the three C's essential to commercial success, namely, capital, capacity and character? To determine these it is necessary, both for the salesman and the credit man, to learn the customer's habit of payment. If competitors have had trouble with a given customer, the chances are that you will have trouble also. How shall it be avoided? The sure answer is to become an intelligent and faithful member of a mutual protective association, for the co-operative exchange of ledger facts for credit guidance.

"Co-operation is the concert of many for compassing advantages impossible of attainment by one, in order that the gain may be fairly shared by all concerned in the enterprise. The instrumentalities for co-operative credit protection are found in the five electrical credit associations operating in Boston, New York, Philadelphia, Chicago and San Francisco, with a total membership of nearly five hundred. Any manufacturer or wholesale dealer in electrical supplies and kindred lines in good standing may, upon application to the organization in the territory in which he is domiciled, be admitted to membership in conformity with the by-laws of the organization to which he applies. The dues in the Boston, New York and Chicago Associations are $40 a year. The Philadelphia Association charges a little more and the San Francisco Association somewhat less. There are no assessments or commissions in addition to these nominal dues. There is a small initiation fee of $10 charged, which entitles the member to a complimentary supply of the forms of the Association, which, if they become exhausted, are re-supplied without further expense.

"The method of operation is as simple of comprehension as the alphabet. If a member has exhausted the customary means of collecting an account and finds that the trade of the customer, by reason of his failure to live up to the terms of the sale, place him in an undesirable class, indicating that he is either unable or not disposed to pay an admitted indebtedness, then the creditor member, for the protection of his five hundred fellow members, reports on Form No. 1 to the local association, of which he is a member, the fact that his customer has failed to pay the stated account. Whereupon the Association sends Form No. 2 to the customer, apprising him of his alleged indebtedness in a stated sum and requesting him to present at once in writing a full and frank statement of the facts, so that the matter may be carefully investigated, as it is not the purpose or intention of the Association to do an injustice to the customer or to anyone, and further stating that unless within ten days from date of mailing of Form No. 2 the Association receives a satisfactory reply to its communication, it must assume that the customer is either unable or unwilling to adjust the matter. If on receipt of this communication the customer makes no reply, or writes, admitting the indebtedness and stating that he is unable to pay it, then after the lapse of twelve days the information is imparted confidentially on Form No. 6 for the credit protection and exclusive use not only of the members in the local association, but to all of the members of the four other allied associations, affiliated with the National Electrical Credit Association, covering the entire United States. Form No. 6 issues from the five associations to the members on Tuesdays and Fridays of each week. Each month a printed bulletin is distributed to the members without charge, containing in excess of eight thousand names of individuals, firms and corporations who are alleged not to have paid or satisfactorily explained or adjusted the amounts for which they have been reported to the Association. As soon as the customer adjusts the indebtedness his name is struck from the bulletin by use of Form No. 8. Nevertheless, pending the adjustment, approximately five hundred manufacturers and jobbers located from the Atlantic to the Pacific Coast and from the northern boundary of the states to the Gulf, have received timely advices that the customers whose names appear in the Bulletin have not satisfac-

torily dealt with the creditor members and have not lived up to the terms of sale.

"The association is in no sense a collection agency. It stands for co-operative credit protection. A letter just received indicates the appreciation in which the service is held. The letter is as follows:

"'We feel especially grateful today to the Electrical Credit Association.

"'A party who from other sources we have been led to believe is responsible, was in our office for the purpose of making a good-sized purchase, but we just happened to open up the May 21, Form No. 6, and find that he owes someone else $1,928.90, and it gave us an opportunity of very gracefully steering clear of any trouble.'

"Others of like import are being received by the allied Associations constantly.

"The associations of Boston, New York, Philadelphia, Chicago and San Francisco are affiliated, as has been stated, into what is known as the National Electrical Credit Association, with offices in Chicago, where the organization has had its headquarters since its formation in 1898. Here are carried the credit records that have been made by sixty-five thousand and more customers during that period. The members of the local associations East, West, North and South, have been able to obtain, without extra charge, accurate, up-to-date, and confidential credit information by telegraphic, telephonic or written communication addressed to the National Electrical Credit Association, Marquette Building, Chicago.

"During the seventeen years that the local associations have operated, the entire trade has become less hazardous than when the industry was in its formative stage, when credit granting was not a science and terms were seldom, if ever, adhered to. Non-members have indirectly benefited by this improved condition but, of course, not to the same extent as members.

"Owing to the unsettled conditions prevailing in the country at the present time, it is increasingly imperative that all representative manufacturers and jobbers in the electrical and kindred trades should unite with the nearest local organization for credit protection, and even though a manufacturer is selling to jobbers and is in close touch with his trade, he should, nevertheless, give encouragement to an organization that is making the entire industry comparatively safe by weeding out the incompetents or those who prey on the thrift of others.

"It is conceded that the extraordinary development and growth of commercial enterprise within the past few years, and the distribution of our vast products of industry in every part of the world, have made it necessary for merchants and business men to organize for the protection of each other in their business against irresponsible buyers. No one can claim, as a matter of right, the privilege of purchasing a commodity of any particular person or number of persons, and the members of the Electrical Credit Associations may lawfully refuse to sell to whom they choose. Competition is always selfish, is frequently disastrous, and sometimes deadly. The National Electrical Credit Association was organized to protect uniformly the legitimate trade, and every representative manufacturer and jobber, no matter where located within the United States, owes it to his house, as well as to the trade generally, to ally himself with a movement which for so many years has continuously worked for the co-operative upbuilding of the electrical trade. No mariner would venture without compass upon an uncharted sea. By the same token no merchant or manufacturer should risk his rich argosies without the protection of the co-operative credit compass and chart.

"The co-operative credit protective system is the cheapest and yet the most valuable service in operation today for the exclusive benefit of the electrical industry. If you concede that two heads are better than one, then you are forced to agree that no matter how complete your credit files may be, nevertheless, the combined credit experience of five hundred fellow members must exceed yours. Stagnation and fossilization in credit departments as surely lead to commercial death as do reckless or ignorant merchandising in sales departments. Both should be up-to-date and have the most approved systems to insure success.

Northern Electrical Company Opens Minneapolis Branch.

The Northern Electrical Company of Duluth, Minn., has just opened a new house at Minneapolis. The local house will conduct a general supply and contracting business, specializing on appliances for the home, office and factory. The Minneapolis house will be under the management of Fred G. Dustin, a gentleman well known in the electrical field. For a number of years he has been chief electrical inspector of Minneapolis, president of the Minneapolis Electric Club, associate member of the American Institute of Electrical Engineers, past-president of the Western Association of Electrical Inspectors, president of the Northwestern Electrical Association, and former treasurer of the State Board of Electrical Examiners.

Sterling Electric Company Opens Fine Store.

Seven years ago, in a small store building at 329 Hennepin Avenue, Minneapolis, the Northern Electrical Company was one of the first to enter the field as an exclusive electrical contracting and supply house, doing all kinds of construction work and retailing such electrical appliances as were then on the market. The business increased so rapidly from almost the beginning that these quarters were soon found to be inadequate and a larger building was then occupied at 9 South Fifth Street where the stock was increased and every known electrical convenience placed on display.

Previous to moving to the larger building, the Minneapolis Electric Motor Company, then occupying a store room at 240 First Avenue, South, was purchased and moved to the new location, and in 1907 the Northern Electrical Company's name was changed to that of the Minneapolis Electric Motor Company, under which title the business was conducted until the first of the year 1912; then, to avoid confusion in similarity of names, the title Sterling Electric Company was chosen.

The Sterling Electric Company has one of the largest electrical supply houses west of Chicago, handling electrical automobile accessories, wireless goods, electrical heating appliances, electrical toys and every electrical specialty now on the market, while new appliances are shown daily.

The trade territory covered by this company extends over the entire Northwest and so rapidly has the business developed that a still larger stock was found necessary and a fine store building at 31-35 South Fifth Street was rented, up-to-date fixtures installed and commodious offices equipped, while the workshop, battery and shipping rooms have been equipped with equally up-to-date facilities. A force of 35 is employed in the office, store and shop, while construction crews numbering over 40 electricians are employed nearly the entire year. Over 3,000 square feet of floor space are occupied by the office and store, while twice that amount of room is utilized for shop and stock room.

William T. McCullough, treasurer of the W. T. McCullough Electric Company, Pittsburgh, Pa., says that their retail business is not large enough to pay freight on the incoming merchandise. This is one of the enterprising companies and is located in the heart of a busy supply district. The selling organization covers western Pennsylvania, eastern Ohio, West Virginia and Maryland. The business was incorporated in 1904.

Public Service Commissions

WASHINGTON.

On May 25 the Public Service Commission issued an order authorizing an arrangement between the Puget Sound Independent Telephone Company and the Bell companies operating in the contiguous territory. After the sale of the Independent telephone companies at Tacoma and Bellingham to the Bell company, the patrons of the Puget Sound Independent Telephone Company were unable to get long-distance connections. They consequently applied to the Public Service Commission to compel the physical connections which would permit of long-distance service. The Bell companies involved agreed, however, to a stipulation providing for such connection without waiting for the hearing before the Commission, and this stipulation has been approved by the Commission. Hereafter business will be interchanged and any question involving an adjustment of rates which is not amicably settled may still be brought before the Commission for adjudication. The stipulation does not include any additional toll lines that may be built outside of the counties in which the Puget Sound Company is now operating.

NEW YORK.

The Public Service Commission for the First District has approved five additional rapid-transit routes and sent them to the Board of Estimate and Apportionment for its approval. With these routes, the work of laying out the lines for the proposed dual system of subways is practically completed. The action of that board on May 24, approving the general plans of the Commission for the dual system, practically assures the consummation of this great rapid-transit undertaking. Within five years it will give to New York City a system of subways and elevated lines containing about 600 miles of single track, and costing in its entirety, including the cost of the existing subway, about $400,000,000, exclusive of the cost of the existing elevated railroads, which will be a part of the system, though owned by private companies.

The Commission has directed its counsel to begin mandamus proceedings to compel the New York Railways Company to construct and operate that portion of its surface-railroad route on East One Hundred and Sixteenth Street between Pleasant Avenue and the East River. There is a ferry leading to Ward's Island, and the present terminus at Pleasant Avenue is several blocks from the ferry, and passengers are compelled to walk this distance. After investigation and hearing the Commission ascertained that the company's franchise extends clear to the river. In its decision it held that the franchise obligates the company to operate the entire route, and therefore called upon it to extend its line to the river and put it in operation by August 1, 19.2. As no move has been made by the company to do so, the Commission resorted to mandamus proceedings to compel the building and operation of the extension.

The Public Service Commission, Second District, has received a petition from the Niagara Falls Power Company asking authority of the Commission to issue $3,567,000, par value, of bonds, including the remaining $335,000 of $1,021,000 authorized by the Commission on February 18, 1910, but not yet issued. The petition also asks for an option to issue $3,567,000 of stock instead of bonds should that course be determined upon. The proceeds of the capitalization to be issued are to be used to build various construction projects of the Canadian-Niagara Power Company, to build constructions now under way, and to capitalize expenditures made out of earnings between January 1, 1909 and April 1, 1912.

CALIFORNIA.

Attorneys for the Pacific Telephone & Telegraph Company have filed application, on behalf of the company, to be allowed to purchase the capital stock of the Home Telephone & Telegraph Company of Pasadena. The value of stock is estimated in the application as approximately $730,000. It is set forth that the Pacific company holds an option on 4,897 shares out of a total of 5,180. The franchise of the Pacific company in Pasadena expired recently and brief extensions have been granted from time to time by the city council, with the understanding that, as soon as convenient, the company would effect an agreement with the Home company.

The petition says a merger of the physical properties of the companies is sought.

MASSACHUSETTS.

According to an opinion rendered by the Railroad Commission, the electrification of the Boston & Providence Division of the New York, New Haven & Hartford Railroad, at a cost of $8,000,000, is consistent with public policy and the terms of the lease of the original line to the New Haven road. A bill providing for such electrification has been pending in the Legislature for some months, awaiting the decision of the Commission. No time is fixed for work provided the measure becomes a law.

INDIANA.

Accident Bulletin No. 19, issued by the State Railroad Commission, shows that there were 4 killed and 64 injured on the interurban roads of the state for the quarter ending March 30. This is an increase in the number of injured over the corresponding quarter of 1911 of 69.

There were 40 casualties to passengers on passenger trains, of which 28 were due to collisions and 12 to derailments. Eleven persons were struck on highway crossings, resulting in one death.

According to a decision of the federal court, the Railroad Commission must modify its order requiring the railroads to equip locomotives with electric headlights of 1,500 candlepower. The court approved the finding of the special master, N. C. Butler, in a suit brought by the Baltimore & Ohio Railroad. The order was held void because it was not clear and specific. It is admitted that the Commission has power to require the railroads to use stronger headlights, but a modified order will have to be issued.

INTERSTATE COMMERCE COMMISSION.

The Interstate Commerce Commission has issued its quarterly statement of railroad accidents for the last quarter of 1911, during which time it appears that 242 persons were killed and 4,706 were injured in train accidents, a decrease of 6 in the number killed, and an increase of 977 in the number injured as compared with the corresponding three months in 1910.

During the same period of time there was a total of 67 train accidents on interstate electric railways, and of these 42 were collisions, 23 derailments, 2 due to other accidents to trains. In the 42

collisions 4 passengers were killed and 240 injured; 6 employees were killed and 22 injured, and one employee not on duty was killed. Out of the 23 derailments, seven were due to defects in roadway, three to defects of equipment, two to negligence of trainmen, signalmen, etc., two to unforeseen obstructions of track, two to malicious obstructions of track, and seven to miscellaneous causes. In these derailments no persons were killed, but it was reported that 97 passengers were injured, 11 employees, and five persons other than passengers and employees but not trespassers.

Of the various accidents in connection with these electric lines other than train accidents the following were reported: 17 employees were killed and 58 were injured; 7 passengers were killed and 264 injured; 1 employee not on duty killed, and 1 injured; 34 trespassers killed and 23 injured; 31 persons not trespassers killed and 162 injured.

Legal Notes

THE RIGHT OF A PUBLIC-SERVICE COMPANY TO EXACT CHARGES IN ADDITION TO MAXIMUM RENTAL FIXED BY FRANCHISE.

By Maguire and Mooney.

In states having public-service commissions, the fixing of rates which shall be fair to investor and customer, lies with the commission. In other states, the possibility of raising rates depends upon the terms of the franchise, and in some cases the rates cannot be raised, even though the revenues yield no dividends. Penalties for delay in payment have been upheld by the courts, and service may be discontinued in case of non-payment.

The question as to the right of a public-service corporation to exact a charge in addition to the maximum rental fixed by the public, for delay in payment, appears to have been raised for the first time in State *ex. rel.* MacMahon vs. Independent Telephone Company, 59 Wash., 156. Such practice as this has been so general among utility companies that it never seemed feasible to contest their right to exact such a charge. In this case the company operated its telephone system in Seattle, and was working under a franchise from the city. The franchise fixed the rate to be charged for one-party residence lines at $2.50, and said that "the foregoing rates shall be the maximum rates to be charged and received for such telephones." On January 27, 1909, MacMahon and the company entered into a contract for the installation of a one-party telephone line at MacMahon's residence, 403 Ninth Avenue, Seattle. The rate fixed was $2.50 per month, payable in advance at the office of the company, on or before the tenth day of each month, to which was to be added all long-distance calls made over MacMahon's telephone. It was then provided that, in case the monthly advance payment was not made, an additional charge of 50 cents each month would be paid by MacMahon as compensation for the additional cost of collecting and handling the account. There was a further provision that in case of the removal of the instrument from one location to another, MacMahon would pay the costs of such removal. In the June following MacMahon moved, and upon his request, the company removed his telephone to his new residence, and was paid for such removal by MacMahon. On November 17, 1909, MacMahon requested the company to remove his telephone to another place, which the company refused to do until he would pay for the months of September, October and November, including the 50-cent charge because of non-payment in advance. MacMahon was willing to pay for everything except the 50-cent charge, and he thereupon commenced suit. His main contention was that, under its franchise, the company had no right to add a charge to the monthly rental.

The court held that a rule requiring the payment of the monthly rentals in advance is a regulation of a permitted character, and so is the further regulation that, unless the service is paid for in advance, it may be denied. Inasmuch as the company was bound to render the public efficient service it had and should have the right to enforce such rules as will provide for the prompt payment of its rentals and thus provide for the securing of funds with which it may insure and protect the efficiency of its plant and keep it at such a standard as will enable it to discharge its public duties when called upon to do so. Accordingly it upheld the 50-cent charge for overdue payments.

This rule is applicable to all kinds of public-service companies, and it has special bearing upon companies supplying electrical energy for the reason that they have a greater system of discounts or extra charges than any other type of public-service company.

In this connection one thing must be remembered. No extra charge can be made that is not reasonable and proper. The company would not, however, seek to place burdens on its customers, so this phase of the matter needs only mentioning.

A public-service corporation is compelled to serve the individual when such service is demanded; but that does not take from it the right to demand that the continuance of such service be conditional upon the prompt payment of a reasonable rental, which shall be sufficient to enable the company to render an efficient service to its patrons, and at the same time provide a reasonable profit for itself. This is the reasoning upon which the courts have held companies of this character justified in withdrawing their service when their charges are not promptly paid, or where a regulation fairly and generally beneficial to the company and its patrons remains uncomplied with.

But this is not the most important phase of this subject. There are many events that would force a public-service company to operate at a loss or to increase its rates, and a discussion of the right to increase the rates is important. These questions may not have arisen so much in the past but they may arise in the future, and now that almost all companies are serving the public at especially low rates it seems possible that with advancing conditions the rates may have to go up in order that the company shall make a profit.

This article can not deal with special

cases but only with general questions. The franchises granted to public-service companies all vary in some degree but they may be placed in certain classes. There are the franchises granted by municipalities in states that have a commission, the commission arranging the rates under which the company is to operate; then the franchises granted by municipalities that contain provisions about a schedule of rates; and finally a mere franchise to install a system in the streets of a city, giving no monopoly of the right to any one company.

Under the commission form, as it is generally provided, the company is not bound to serve the public at a loss if the original schedule of rates was found to be inadequate to meet present conditions. In the case of City of Dawson vs. Dawson Telephone Company, 72 S. E., 508, the Mayor and Council of Dawson, Ga., passed an ordinance permitting the company to erect, operate, own and control a telephone system in Dawson. It was expressly provided that the company agreed and bound itself to charge $1.50 a month for residence telephones and $2.50 a month for business telephones and to furnish free service to the various departments of the city. The company began business under the ordinance and charged for its service the rates set forth in the ordinance. The company later applied to the Railroad Commission of Georgia and after a hearing the Commission allowed the company the right to increase its rates to $2 for residence telephones and $3.50 for business telephones, and the company thereupon put the new schedule into effect. The City of Dawson objected to the new arrangement and filed suit. The court held that the city was not especially authorized to fix the charges to be made but that the Railroad Commission was authorized and therefore sustained the new charges made by the company.

Even though this question came up in a telephone case it applies with equal force to electric power companies, for it is a rule affecting all public-service corporations. In states provided with a commission, the rates of the various companies are generally fixed by that body, and the ordinances of the city ordinarily contain nothing about rates.

In states where the municipalities have full power to grant the franchise and regulate the rates the matter is somewhat different. After entering into its contract with the city, for the acceptance of a franchise is nothing more than the completion of a contract, the company is ordinarily required to furnish current at the rates therein stated until the expiration of the franchise. But there are occasions and circumstances that may permit the company to increase its rates. If there is no provision in the franchise for a subsequent increase if it should happen that the company was not making a profit, it is doubtful if the company could increase the rates.

A court will never attempt to make a contract for a company, nor to read into a franchise provisions that are not there. The court merely construes and interprets the meaning of the contract. Thus in the case of The People vs. Chicago Telephone Company, 220 Ill., 238, the court refused to consider anything except the franchise and ordinances involved. In this case the telephone company accepted a franchise in which it was permitted to charge certain rates for certain service in the City of Chicago. After this was done other territory was annexed to the city. The company then claimed the right to make such charges for service as it saw fit as to the annexed portions of the city, claiming that the ordinance could not control these portions. The court held against this claim, and said that the rates, being higher than the ordinance permitted, were illegal.

A company may be losing money on one branch of its service, yet it cannot ask to have its rates increased, if its franchise permits this, unless its rates are so low on all branches that it is making no money. It is important to know what part of the business must be considered when the cost of supplying current is raised. The actual operation of the plant to obtain the current should be computed, but indirect departments of the business apparently have no connection. Thus, in supplying electric current to a company, the sale of fixtures, lamps, etc., would have little bearing on the actual cost of the current, but it is the law that where an electric company invested part of its capital in merchandise and engaged in the sale of fixtures and lamps, and took contracts for wiring, and the compensation of its employees in the department was charged against the revenue derived from its sale of electricity to consumers, the returns from this branch of the business should be considered in determining whether rates for electric current fixed by ordinance produced a reasonable return on the capital invested. (Arkadelphia Electric Light Company vs. City of Arkadelphia, 137 S. W., 1093.) Thus the mere purchase of merchandise with part of the company's capital will make this part of the business chargeable.

A corporation engaged in furnishing electric current, like other quasi-public corporations, is entitled to earn a fair income on its investment, and may fix rates based on the cost of production, taking into account not only the cost of coal, labor, etc., but the investment necessary to carry on the enterprise, and acting in good faith, it may make experimental contracts to reach a basis for future charges, even though this would result in giving for a limited time a better rate to a few customers than was given to others receiving substantially the same service.

But a public-utility company which accepts the conditions as to rates to be charged by it, imposed by a municipal corporation as a condition to its use of the streets, cannot complain that the rates are not reasonable, where there was no provision in the franchise for a change if it were found the rates were inadequate to meet later conditions. In this case the time to have urged such an objection was before the franchise was accepted and before the company availed itself of the privileges therein contained. In the case of Westfield Gas and Mill Company vs. Mendenhall, 41 N. E., 1033, the town of Westfield had provided a maximum schedule of rates to be charged to customers for the supply of gas. Under the ordinance the company contracted to furnish gas to the inhabitants of the town and agreed that, in consideration of the town waiving its rights to require the company to pay a license fee for the use of the streets, it would furnish gas in accordance with the schedule of rates. The company afterward gave notice that, when the contracts with customers then current should expire, it would increase the rate 20 cents each month. Some of the customers applied for an injunction to restrain the company from so raising the rate, and the court held that the company should be restrained from raising the rates.

Interesting Cases.

VALID PROVISION IN LEASE OF SIGN.—The Appellate Term of the Supreme Court of New York holds valid a provision in a written lease of an electric sign which provided that $3.75 per week should be paid for same, but that, in the event of a breach of the agreement by the lessee, the company had the right to remove the sign, and the lessee agreed to pay $8.75 for each unexpired month of the term specified in the agreement. The court says that the contract provided that the $8.75 a month, which in the event of a breach by the lessee the latter agreed to pay during the unexpired term of the contract, was "agreed to be the actual loss suffered by the company by reason of such breach." This sum was agreed to be paid as liquidated damages, and not as a penalty, and the provision of the contract requiring such payment was valid.—Federal Sign System (Electric) vs. Soutsos, 132 N. Y. S., 761.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 71.—Comparative Reliability of Gasoline and Electric Trucks.—Have any of your readers comparative data showing the time for a period of, say one year that gasoline and electric trucks of two tons capacity are out of service due to breakdowns or repairs?—W. N. R., New Orleans, La.

No. 72.—Wind and Wireless.—I have heard that strong wind blowing across an electric transmission line sets up static charges on the line. Since it has come to be the practice to use horizontal antenna wires in wireless telegraphy, does the blowing of a strong wind across these wires interfere with the working? Is there any disturbance of the delicate receiver from this cause?—H. T. M., Crown Point, Ind.

No. 73.—Placing of Wall Receptacles.—Where is the best position for wall receptacles, in or close to the baseboard or about three or four feet above the floor? If placed close to the floor, do they not become more easily clogged with dirt in sweeping?—J. S. D., Jackson, Mich.

No. 74.—Electric Starter for Automobiles.—In the electric self-starters now being used for gasoline automobiles what provision is made against overdischarging the battery in case the engine refuses to start? What prevents the battery being continually overcharged?—V. B., Milwaukee, Wis.

No. 75.—Starting a Distant Pump.—We are planning to install a four-stage centrifugal pump which will be driven by a 75-horsepower, three-phase induction motor supplied with current from a central station a mile away. The pump will deliver water to a standpipe, equally distant, against an average pressure of about 90 pounds. Is there any practical way of starting this pump without sending a man to the pumping station? There will be a check valve in the discharge line. Is there an automatic way of priming such a pump?—J. W. L., Chapel Hill, N. C.

Answers.

No. 64.—Effect of Sagging Tungsten Filament.—If a wire-type tungsten lamp is hung at an angle so that the filament sags after being heated, does the permanent set thereby produced render the filament more fragile than if it had been hung vertically?—P. H. E., Dixon, Ill.

The life of tungsten lamps hung at an angle from the perpendicular seems to be just the same as that of those hung perpendicular. I have for the last two years kept a record of a number of installations where lamps were installed at different angles and there is apparently no difference in the life of same. My records show that there is some lack of uniformity in the life of tungsten lamps and I think the cause of this is variation in the diameter of the filament and defects which cause uneven temperatures. I have obtained the best results from tungsten lamps by burning them at a lower efficiency than they are rated at by the manufacturers.—C. T. P., San Francisco, Cal.

The fragility of the filament in a tungsten lamp is dependent on two conditions: first—the type of filament, and second—the strain which is placed on the filament. The filament made from some alloy of tungsten is naturally more fragile than the filament drawn from the pure metal owing to its brittleness. It is this characteristic of the alloy filament which prevented the tungsten lamp coming into more general use than it has. It was found that when a lamp of this kind was suspended at an angle the filament was more subject to breakage than when suspended vertically. As soon as a process was developed by which pure tungsten could be drawn into a wire the danger of breakage was considerably decreased. The strength of the former type was dependent on the success obtained in sintering the particles of tungsten together and when there was even one weak spot the entire filament was weakened accordingly, whereas the latter type of filament owes its strength to the fact that it is a pure and continuous tungsten wire. Even now it is preferable that a tungsten lamp be suspended vertically, although there is not as much chance for breakage as with the old-style lamp. When a tungsten lamp has burned for some time in an angular position the various sections of the filament sag and obtain more or less of a "set." The filament at the points of support conforms to the shape of the supporting arms and consequently there is less "play" to take care of shocks. If the filament is hung vertically there is no chance for the filament loops to bind on the supporting arms. Another feature of this more or less permanent set should be considered. In case it is necessary to remove the lamp from the socket for any reason whatever and the lamp is not replaced in the socket so that the filament will hang in the same exact position as formerly, the filament will have to adjust itself to a new set. Were this to be repeated several times it would undoubtedly impair the life and strength of the lamp. This feature is not found in a vertically hung lamp as it does not matter whether the lamp is replaced exactly as before removal, as long as the lamp is suspended vertically. The catenary curve which the filament assumes is in itself a disadvantage as it introduces internal stresses which are not met with in a filament hung vertically. These stresses tend mostly to lengthen the filament at the expense of its diameter. The experience of illuminating engineers seems to indicate that the vertically hung lamp gives better service in general, both from breakage and from efficiency standpoints, and it is probably for this reason that they do not recommend the use of a tungsten lamp in an angular position except where it is impracticable to hang it vertically.—E. C. B., Kansas City, Mo.

No. 67.—Trouble With Electric Washer.—We are having some annoyance with electric washers becoming surcharged with electricity to the extent that it becomes very difficult to get the clothes out of the machine. The trouble does not persist and never lasts throughout the washing nor does it appear two consecutive weeks. It seems to appear in only two places out of eight that are identically equipped. The washer used in the writer's home for three months without the slightest trace of current leak, when taken to one of the trouble zones, was immediately charged very heavily, but the trouble disappeared after the first tubful of clothes had been washed. We grounded the motor frame to the castor before trying it. Westinghouse induction motors are used on the machines. What is the cause of this trouble and how can we remedy it?—C. W. G., Washington, Ill.

In the case of the washing-machine trouble I believe the remedy will be found by removing the static electricity from the device. In my experience I have found that static electricity sometimes plays queer pranks and these are nearly always intermittent in their appearance. This would account for the trouble appearing one week and not during the next, because of the atmospheric conditions. If there is a belt on the machine, and there usually is, the static electricity is often generated by an action existing between the belt and the pulley, known as cleavage or the sudden separating of fibers. This frequently occurs in the operation of rapidly running and dry belts. Since the trouble disappears a short time after the work is started, my theory is substantiated that the atmosphere becomes charged with moisture, as also the parts of the machine. In order to avoid even the slight shocks the motor frame should be thoroughly grounded, or the belt treated with a belt dressing.—D. S. J., Pittsburgh, Pa.

No. 68.—Data for 60-Cycle Fans.—What is the energy consumption of standard 110-volt, 60-cycle fans of the 8-inch, 12-inch and 16-inch sizes? How is this influenced by the speed, that is, what is the relative consumption at full speed, medium speed and low speed?—H. F. A., Dubuque, Iowa.

The table herewith gives the power consumption of Westinghouse 110-volt, 60-cycle fan motors of the 8-inch, 12-inch and 16-inch sizes and cast-iron and drawn-steel-frame types. This statement gives the rated consumption

POWER CONSUMPTION OF WESTINGHOUSE 110-VOLT, 60-CYCLE FANS.

8-inch Desk Fans.			
Speed	1750 R.P.M.	1400 R.P.M.	1200 R.P.M.
Rated	20 Watts	19 Watts	18 Watts
Tested	20 Watts	17 Watts	15 Watts
12-inch Cast-Iron Frame Fans.			
Speed	1500 R.P.M.	1300 R.P.M.	
Rated	45 Watts	42 Watts	
12-inch Drawn-Steel Frame Fans.			
Speed	1600 R.P.M.	1450 R.P.M.	1300 R.P.M.
Rated	40 Watts	37 Watts	35 Watts
Tested	39.5 Watts	36.5 Watts	35 Watts
16-inch Cast-Iron Fans.			
Speed	1500 R.P.M.	1250 R.P.M.	
Rated	90 Watts	85 Watts	
16-inch Drawn-Steel Fans.			
Speed	1575 R.P.M.	1450 R.P.M.	1300 R.P.M.
Rated	75 Watts	73 Watts	72 Watts
Tested	72.5 Watts	71.5 Watts	71 Watts

as published in the data sheets and also the results of actual tests at the various speeds. It will be noted that the published figures are conservative, since the test results are lower in nearly every case.—W. R. P., Chicago.

The following table gives a summary of the usual speeds and wattages for standard single-phase, 60-cycle desk (or bracket) fans, operating on 110 volts.

Size.	Speeds.	Watts.
8-inch.....	1200-1400-1750	15-18-20
12-inch.....	1000-1300-1600	40-42-45
16-inch.....	1000-1300-1600	80-85-90

These figures are based on the four-pole induction type motor which is now generally used, but are applicable to the commutator type as well. They are also approximate as the actual speeds and wattages depend entirely on the quality of the design of both the fan motor and the fan blades. Fan blades having a "dip" of 2 inches will naturally place a heavier load on the motor than those having only 1.25-inch dip but will move more air per second than the smaller dip. Therefore when comparing fans in regard to speeds and wattages the volume of air moved by the blades should also be taken into consideration. Some factories have even gone so far as to design special blades for their fan motors which they claim will move with a given dip and watt consumption a greater volume of air per second with less noise than others. It will be seen by reference to the table that the changes in speed affect the wattage consumption but little, comparatively. Were the speed alone involved the wattage difference between the low and high speeds would be considerably greater, as the lower the speed the less air moved and consequently less energy would be consumed. The speed variations are, however, obtained at the expense of efficiency as resistance is placed in series with the field windings in order to reduce the voltage applied to the field coils. As the current must necessarily pass through this resistance on the low and middle speeds to cut the speed down there is an I^2R loss due to the resistance added to the actual energy consumed in the fan motor itself. On the high speed the motor is operated without any resistance being inserted. Some fans are so well designed that the friction in the bearings and windage are so low and the efficiency of the motor and fan blades so high that they operate on first speed at between 1,700 and 1,750 revolutions per minute even in the 12 and 16-inch sizes with no greater power consumption than shown, whereas the theoretical speed for a four-pole induction motor is 1,800.—E. B. C. Kansas City.

No. 70.—Arrangement of Three-Phase Line.—In building a three-phase power line, is it better to put all three wires on one cross-arm or to arrange them in a triangle with one on top? Can the top wire be placed right on top of the pole itself so as to require only a short cross-arm for the two lower wires?—N. T. P., Charlotte, N. C.

As no data are given as to distance, voltage, or the amount of power to be delivered, this question can only be answered in a general way. In transmitting alternating current any great distance, or even a couple of miles, it is the general practice to arrange the wires in the shape of an equilateral triangle. Where current is sent only a short distance and the amperage is low or the drop, or unbalancing is of minor importance, then wires are arranged in the most convenient fashion. There are a number of standard methods of arranging the wires and a few of these are shown in the accompanying sketches. Fig. 1 shows a small cross-arm mounted at the top of the pole for the third wire, the other two being on the lower two-pin arm; this is about the best construction where wooden poles are used. Fig. 2 shows a cheaper method which is not recommended on account of the top pin working loose in course of time and the hole for same catching water which soon rots the pole top out. A bracket could be used at the top of the pole in place of the pin. Fig. 3 shows a case where more than one set of wires are used. It is desirable to keep the wires as close together as possible, eighteen inches being about the minimum distance on account of the liability of the wires coming in contact with each other.—C. T. P., San Francisco, Cal.

In order to have a balanced condition as nearly as possible on a three-phase power line it is desirable to arrange the three conductors in a triangle, as the capacity action between wires is dependent, other conditions being constant, on the distance between the wires. It is this capacity effect that will determine the value of the charging current. In order that the charging current in each wire will be the same it is necessary that the capacity effect between all three wires be the same as nearly as practicable and the only way to obtain this condition is by arranging the conductors in a triangle. The relative position of the apex of the triangle is immaterial as far as the balancing of the three wires are concerned. It does, however, enter into consideration from a maintenance standpoint to some extent. Where the wires are on the top arms and arranged as an inverted triangle they are more accessible.—E. C. B.

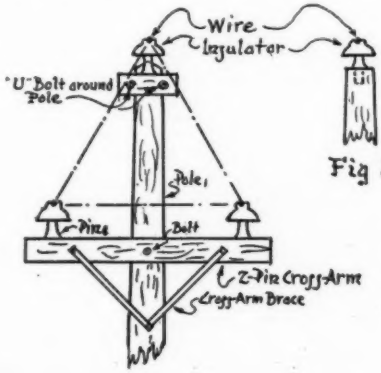


Fig. 1.

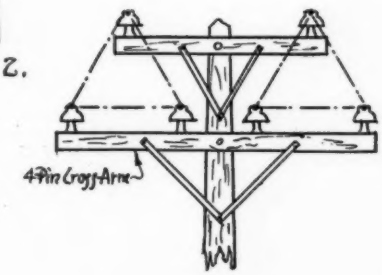


Fig. 3.

CO-OPERATION BETWEEN CENTRAL STATION AND BUILDING PLANT.

By W. A. Blonck.

The object of this article is to point out the desirability of co-operation between central-station companies and the owners of large buildings operating their own heating and lighting plants and to show how this co-operation will be of decided mutual benefit to each of these interests. Heretofore there has not been the friendly feeling between them that should have existed. The central station has been willing to treat with the building owner only on terms of practically unconditional surrender. On the other hand, the private-plant owner has generally been reluctant to avail himself of any of the advantages of central-station service, since, on account of the scarcity of district heating plants, he has had to put in a steam plant any way. There is a common meeting ground, however, where each of these parties can advantageously help the other. It is true that there are a great many things to be taken care of before such a co-operative scheme can be worked out, but as soon as its marked advantages are made clear to all parties concerned the difficulties will prove to be small.

It is well to look at this question first from the standpoint of the utilization of the heat energy of coal. It must be understood that of the energy in every ton of coal burned in a large central station for the generation of electricity only about 12 per cent is converted into salable energy, the bulk of the remainder being carried off as heat in the condensing water. On the contrary, of the energy in every ton of coal burned in an office-building heating plant almost 70 per cent can be converted into usable heat and about 200 kilowatt-hours electrical energy can be gained as by-product, the latter representing a value of $6 to $20 per ton of coal burned, depending on the use made of this energy and the rate received for it. In other words, a building owner who operates a large heating system in the winter and does not avail himself of the electrical energy that can be easily gained by this process, without diminishing the heating effect of the coal, can be compared with an old-fashioned butcher who sold only the meat of the animal he had slaughtered and threw the rest of the carcass away. We know now that the modern packer has grown rich on the profits from the by-products of his industry.

An entirely different aspect of the matter presents itself in the summer time, however, when coal is used in an isolated plant for the sole purpose of producing electrical energy. Then the building owner must burn nearly four tons of coal for the generation of a certain amount of energy, while that same amount of energy can be produced in the large central station through the consumption of only one ton of coal. Moreover, the building owner buys his coal in small quantities instead of in train-load lots, as the central station, and furthermore he must have all the coal hauled by wagon to his office building, which usually is located in the downtown district and not adjacent to railroad tracks. This means, in a nutshell, that in summer, the building owner must pay something like five times as much for the fuel he needs to generate, say, 1,000-kilowatt-hours as does the central station pay for the fuel it requires to generate 1,000-kilowatt-hours.

From this it is very evident, therefore, that the building owner should in summer, be able to buy all the electrical energy needed in his building very much cheaper from the central station than he can produce it himself and still leave a good margin for profit to the former. Thus, there exists a distinct line of demarkation where the building owner should cease to produce his energy and the central station should step in and furnish it.

Now let us look at the matter from the standpoint of the central station. In the winter time there is a pronounced peak load in all large urban central stations when the lighting load comes on late in the afternoon; this is largely due to office buildings and similar consumers. In the summer time there is little lighting load from office buildings and practically no lighting peak on the central-station system; in fact, much of the central-station equipment is substantially idle and bringing no returns on the investment. The desirability of distinctively summer load is therefore at once apparent.

By co-operation with the building owner along the lines proposed the central station can (1) secure an increased summer load without additional investment, (2) reduce its winter peak, (3) improve its yearly load-factor, (4) decrease its fixed charges per unit of energy sold, and (5) secure higher gross and net revenues and therefore greater returns to its stockholders.

The advantages accruing to the building owner may be summarized as follows: (1) most efficient use of fuel in the winter time, (2) low cost of electrical energy during the heating season, (3) elimination of coal, ashes and dirt during the summer, (4) saving over former operation, due to lower cost of summer energy, and (5) cheaper power machinery and smaller investment and fixed charges. The last is due to the fact that expensive Corliss engines and high-efficiency apparatus are not warranted when the plant runs only part of the year and particularly that part of the year when the energy generation is in the nature of a by-product to the heating supply.

Besides these advantages that accrue to each of the parties directly concerned, there are benefits to the community at large, because of the decidedly cleaner atmosphere and reduction of haulage and dirt in the streets in summer. This makes the city attractive to visitors and citizens alike. To the citizens in general a reduction in electricity rates will probably accrue from the higher load-factor and net revenue of the central station. A still broader benefit is that in line with the conservation of natural resources, since the plan proposed may result in the saving of possibly over 50 per cent of the coal now burned in the business district during the summer months.

In carrying out the proposed co-operative scheme several things will have to receive due consideration. One is that the plan is not practically applicable to many existing buildings in which there is much steam-driven auxiliary apparatus that has to be operated throughout the year. However, it must be noted that there is a marked tendency now to install electric elevators, motor-driven pumps and other electrically operated equipment that formerly was driven by steam or hydraulic power. This is especially true in new buildings, in which the only demand for heat in summer is the very limited supply of hot water to lavatories and sinks, which can be provided from a small heater.

An apparent difficulty is the question of labor—what shall be done with the plant operatives during the summer? This is purely a question of management, of finding diversified duties for a relatively small number of men. Summer is the natural time for overhauling equipment, making repairs, improvements, etc.

The problem of determining the central-station rates to be applied to the summer load has already been settled in many large cities where enterprising central stations have established off-peak rates. To sum up the whole matter, it is a question of carefully weighing the many advantages against the few disadvantages and of determining where the economic balance lies. At any rate the issues must be considered with an open mind and the former bitter feeling between the isolated-plant and central-station interests must give way to a realization that they can be of material benefit to each other.

NOTES ON NIAGARA FALLS INDUSTRIAL DEVELOPMENT.

By Frank Koester.

When the American public and the press thought that the establishment of the large hydraulic developments on the American side would seriously affect the beauty of Niagara Falls, new companies established hydroelectric developments on the Canadian side; thus the American public saw that the water would be diverted from the Falls, anyway, so that the United States took up the matter with the British Government and in June, 1906, a bill was passed for the control and regulation of the waters of the Niagara River, the preservation of the Falls and other purposes. This act, known as the Burton Act, permits the diverting from the Niagara River, on the American side, of an aggregate amount not exceeding 15,000 second feet. Further, it allows revocable permits to divert additional water from the river on the American side to such an amount, if any, as shall not injure the river as a navigable stream or boundary stream or shall not injure the scenic grandeur of the Falls, but no such permit shall be issued until approximately the 15,000 second-feet have been diverted. Further, it permits the transmission of power from Canada into the United States to the aggregate amount of 160,000 horsepower. Further, it grants revocable permits for the transmission of additional electric power from Canada into the United States, but in no case shall the amount included in such permits, together with the 160,000 horsepower, mentioned above, and the amount generated and used in Canada exceed 350,000 horsepower.

The permits issued to import power from Canada into the United States were as follows: International Railway Company, 1,500 horsepower; Ontarian Power Company, 60,000 horsepower; Canadian Niagara Falls Power Company, 52,500 horsepower; Electric Development Company, 46,000 horsepower, a total of 160,000 horsepower.

A certain amount of power is reserved for Canada in such a way that the three principal Canadian companies agree that the amount of power to be supplied in Canada, wherever so required, is not less than one-half the quantity generated.

The commissioners of Queen Victoria Park granted the Electric Development Company permission to erect a power plant within the park and to divert sufficient water from the Niagara River to develop 125,000 horsepower for commercial purposes.

The plans of this company provide for eleven units, each of a nominal capacity of 12,500 horsepower; thus, one unit is being regarded as a spare unit, making a total nominal capacity of 125,000 horsepower. There are at present in operation six units, while three more units are being installed. Under the terms of license this company pays a yearly rental of $15,000 for the first 10,000 horsepower or less; for each additional horsepower generated, used, sold or disposed of, the annual rental for 10,000 to 20,000 horsepower is $1 per horsepower; from 20,000 to 30,000, $0.75; above 30,000 horsepower, $0.50 per horsepower per annum. That is to say, by way of example, the gross yearly rental for 40,000 horsepower is $37,500.

The power plant of the Canadian Niagara Falls Power Company is located similarly to the before-mentioned plant above the Falls. The plans, as approved by the commissioners, call for a total plant capacity of 121,000 horsepower comprised of eleven units, each of 11,000 horsepower. This plant operates in parallel with power plant No. 1 and No. 2 of the Niagara Falls Power Company on the American side.

The company agrees to pay for its privilege $15,000 per annum, payable half yearly for the first 10,000 electrical horsepower and for each electrical horsepower generated and used, sold or disposed of $1 per annum from 10,000 to 20,000 horsepower; $0.75 from 20,000 to 30,000 horsepower; $0.50 over 30,000 horsepower. Thus, 40,000 horsepower would bring in an annual rental of $37,500.

The plant of the Ontario Power Company, located at the gorge below the Falls, has at present a capacity of 114,000 horsepower. It is the largest of all the plants at the Falls. It is contemplated, when the power demands, to increase this plant, giving it a maximum capacity of 200,000 horsepower.

This company had to pay to the Park commissioners as clear yearly rental $30,000, payable half yearly. In addition, for each electrical horsepower generated, used and sold or disposed of $1 per annum, from 20,000 to 30,000 horsepower; $0.75 from 30,000 to 40,000 horsepower; $0.50 over 40,000 horsepower. Thus, for example, for generating 40,000 horsepower the rental value is $47,500.

The Ontario Power Company has contracted to supply the Hydroelectric Power Commission with electrical energy as required, up to an amount aggregating 100,000 horsepower upon terms as follows: $9.40 per horsepower per annum for power at 12,000 volts until 25,000 horsepower or more is taken; if this is consumed, then for all the power received $9.00 per horsepower per annum; $10.40 for power at 60,000 volts and until 25,000 horsepower or more is taken; then $10 for all power received. If power is taken at a higher voltage the price is to be fixed by arbitration.

The Ontario Transmission Company, the Ontario Distributing Company, the Falls Power Company and the Niagara, Lockport & Ontario Company are transmission companies allied with the Ontario Power Company. While some of these companies received a large amount of power, especially the last-named, the Hydroelectric Commission of Ontario probably plays the greatest factor among the companies receiving power from the Ontario Power Company. This is due, no doubt, to the excellent engineering features of the 110,000-volt distributing system and the great political aspect attached to this Canadian governmental undertaking. The latter factor, no doubt, will play a prominent role in future hydroelectric developments in the United States. A somewhat more detailed account of this autocratic undertaking will be given in another issue.

Spontaneous Heating of Coal.

In a preliminary report of the Bureau of Mines, the causes of the spontaneous combustion or heating of coal are discussed, but little light is thrown on the underlying causes. Oxidation depends, however, upon the surface exposed to the air, and can be prevented by submerging in water. Oxidation takes place only where the air supply is sufficient to support oxidation, but insufficient to carry away all the heat formed. Dust is dangerous, particularly when mixed with lump coal. High volatile mater does not of itself increase the liability to spontaneous heating. Coals having already a high oxygen content seem to absorb oxygen more readily and show a marked tendency to spontaneous combustion.

It has often been claimed that the presence of moisture and of sulphur promote spontaneous heating, but the investigations have not substantiated this.

Freshly mined coal and fresh surfaces exposed by crushing lumps exhibit a remarkable avidity for oxygen, but after a time the surfaces become coated with oxidized material, "seasoned," as it were, so that the action of the air becomes much less vigorous. In practice, coal that has been stored for six weeks or two months and has even become already somewhat heated, if rehandled and thoroughly cooled by the air, seldom heats spontaneously again.

A large power plant in the New York district crushes its coal to pass a 4-inch screen immediately after unloading from barges and leaves the fines and dust, 50 per cent or more of the

total, in the coal to be stored. This freshly crushed coal is elevated to iron hopper-shaped bunkers in which, as they are directly over the boilers, the air temperature is often 100 degrees Fahrenheit. As the coal may hang on the sloping sides of a bunker for three or four months, it is not surprising that there are fires in one or another of the bunkers practically all of the time.

Suggestions on Storing Coal.

With full appreciation of the fact that any or all of the following suggested precautions may prove impracticable or unreasonably expensive under certain conditions, they are offered as advisable for safety in storing bituminous coal.

(1) Do not pile over 12 feet deep, nor so that any point in the interior of a pile will be over 10 feet from an air-cooled surface.

(2) If possible, store only screened lump coal.

(3) Keep out dust as much as possible; to this end reduce handling to a minimum.

(4) Pile so that lump and fine are distributed as evenly as possible; not, as is often done, allowing lumps to roll down from the peak and form air passages at the bottom of the pile.

(5) Rehandle and screen after two months, if practicable.

(6) Do not store near external sources of heat, even though the heat transmitted be moderate.

(7) Allow six weeks' seasoning after mining and before storing.

(8) Avoid alternate wetting and drying.

(9) Avoid admission of air to interior of pile through interstices around foreign objects, such as timbers or irregular brickwork, or through porous bottoms, such as coarse cinders.

(10) Do not try to ventilate by pipes, or more harm may often be done than good.

Wireless Stations Along Arctic Ocean.

The Russian Duma has been asked to appropriate $515,000 for the erection and equipment of wireless telegraph stations on the Kara and White Seas. The project is intended to insure telegraphic communication via the Arctic Ocean between the northern and western parts of Siberia and St. Petersburg, Russia.

The California-Oregon Power Company is installing on Klamath River, Cal., near Fall Creek, two 18,000-horsepower Francis-type turbogenerators to operate on a 130-foot head. This head is gained by the construction of a dam 130 feet high, with a 300-foot crest, creating an 800-acre lake. This work will be completed by January, 1913.

Magnetic Properties of Alloys.

The sixty-third meeting of the Faraday Society was held on April 23, at the Institution of Electrical Engineers, London, England. The meeting was devoted to a general discussion on "The Magnetic Properties of Alloys," and was presided over by Sir Robert Hadfield.

The chairman in his introductory remarks gave a brief account of the early work in this field, referring more particularly to the non-magnetic ferro-alloys with which he had been associated. He pointed out how magnetic properties depended on heat treatment as well as on composition, and showed a bar of manganese steel which was magnetic at one end and non-magnetic at the other. To illustrate the necessity of working carefully through whole series of alloys before any conclusions could be arrived at, he remarked that whereas a five-per-cent manganese-steel was very brittle and magnetic, the addition of 14 per cent of nickel rendered the steel both very tough and non-magnetic.

The first paper was read by E. Gumlich, of Berlin, and dealt with "The Magnetic Properties of Iron-Carbon and Iron-Silicon Alloys."

The experiments conducted by the Physikalisch-Technische Reichsanstalt, on which the author reported, were aimed at investigating the relations between the magnetism of iron alloys and their chemical composition and thermal treatment. The results concern magnetization up to saturation, coercive force, residual magnetism, and the electric resistance of the alloys iron-carbon and iron-silicon. Carbon behaves in these alloys in very different ways according to the thermal treatment (slow or rapid cooling) it has undergone, and the differences can be traced in the physical properties, as well as in the structure (cementite, pearlite, martensite, temper-carbon) which is characterized by the presence of the carbon. The carbon which is *dissolved* in the iron has the strongest influence upon the magnetic properties, and it has resulted that the coercive force of these alloys increases proportionally as the dissolved carbon, while the residual magnetism decreases. These conclusions are important for the manufacture of permanent magnets. The carbon present as impurity plays, however, also an exceedingly important and very disturbing part in the manufacture of dynamo steel, transformer iron, etc., which are to be particularly soft magnetically, because the carbon decreases the permeability and increases the hysteresis loss. Since carbon cannot altogether be eliminated in practice, the manufacturer has to attempt to render it innocuous so far as possible, and the author's experiments demonstrate that a considerable addition of silicon has this effect. In 1890, Barrett, Brown, and Hadfield published experiments which proved that the addition of silicon to iron diminishes the electric conductivity without impairing the magnetic properties. On the strength of these observations, the Reichsanstalt induced Germaii iron works to make transformer sheets out of silicon-iron in order to reduce the Foucault-current losses in the transformers. The realized improvement was much greater than was expected; for it resulted that the magnetic properties were generally improved, and the hysteresis losses in particular much reduced. The part which the silicon plays in this improvement is not clear yet. The experiments of the Reichsanstalt show that the influence is not a direct one, for in that case the magnetization should increase with increasing silicon percentage, particularly in fields of high intensity. The *saturation* value should hence *increase* whereas it *decreases*, just as if the silicon were a non-magnetic addition to the iron merely acting by reducing the effective cross-section of the iron. The influence of silicon is hence indirect, and it seems in some way to counteract and to eliminate the detrimental effect of the carbon. For it would appear that on continued heating the carbon cannot remain *dissolved* in the iron, being transformed partly into the less detrimental cementite, and partly into the altogether harmless temper-carbon.

E. Wedekind, of Strasburg, then read his paper on "Relations between the Magnetism and the Stoichiometrical Constitution of Chemical Compounds."

The present state of our knowledge concerning the dependence of the magnetic properties of compounds upon the nature and the number of the elements entering into combination may be summed up in the following statements. (1) The magnetism of simple chemical compounds, derived from a ferromagnetic metal or a metal of latent magnetism, is a well defined molecular property of the compound which is connected with the stoichiometrical composition or with the constitution of the compound. (2) The magnetism of simple compounds of ferromagnetic metals is throughout essentially feebler than that of the metal, so far as independent representations of valencies are concerned. (3) Simple compounds of metals of latent magnetism (Mn, Cr, V, presumably also Ti) are as a rule more strongly magnetic than the metals; the maximum intensity depends upon the stoichiometrical composition, however, particularly in cases where several compounds exist of the same components. Manganese has a maximum in its trivalent state with regard to the elements which can themselves be trivalent, *i. e.*, in the atomic ratio 1 : 1. Some of these compounds behave like permanent magnets. (4) With the independent oxides of manganese, chromium and vanadium, the susceptibility appears to be a function of the metal percentage, in the case of the vanadium sulphides a linear function of the sulphur percentage; the magnetic susceptibility is thus dependent upon the valency of the metal in the respective compound. (5) So-called mixed oxides or sulphides which do not represent uniform valencies are with *all the metals* more intensely magnetic than the independent classes of compounds. There is a correlation with the acid nature of the one component, which always represents the higher oxide. Such a compound is always graphically revealed by a sharp bend in the curve. (6) The magnetic susceptibility decreases on the whole with decreasing atomic weight of the chief metal. Several manganese compounds are still ferromagnetic. Of chromium compounds only the two mixed oxides already referred to are still ferromagnetic; none of the vanadium compounds are any more decidedly ferromagnetic. The minimum is probably reached in titanium and its compounds which are now being investigated.

James G. Gray and Alexander D. Ross, of Glasgow, presented a paper "On the Magnetic Properties of a Variety of Special Steels at Low Temperatures."

Specimens of iron, carbon-steels, silicon-steels, chrome-steels, etc., were tested at room temperature and when immersed in boiling liquid air, in the conditions brought about by normalizing, annealing, and quenching the metal at various temperatures. It was found that the effect of cooling the specimens was in general to diminish the permeability for low field strengths, and to increase it for high fields. A magnetization curve corresponding to —190 degrees centigrade lies initially below and finally above one corresponding to 15 degrees. This is shown to be in harmony with the theory of elementary magnets whose intensity of magnetization and polar length varies with the temperature. It was found that in general the crossing point of the *I-H* curves corresponding to 15 and —190 degrees centigrade respectively, is higher the greater the amount of the added element present. This rule holds in any of the conditions mentioned above. The value of the magnetizing field necessary to bring about crossing of the magnetization curves for the material at 15 and —190 degrees is very low in the case of chrome-steel. For a specimen of this variety of steel containing one per cent of chromium the curves crossed for a field strength of 8 gilberts per centimeter. Cooling to the temperature of liquid air results in the coercive force being increased, and this effect is very pronounced in the case of materials which have been quenched. For high-carbon steel in the quenched condition the coercive force at room temperature is 32; at —190 degrees centigrade it is 50.

Alexander D. Ross also read a paper "On the Magnetic Properties and Microstructure of the Heusler Alloys."

The paper describes a series of tests on ternary alloys of copper, manganese, and one of the elements aluminum, tin, antimony, and bismuth, and also on several magnetic binary alloys. Details are given of the method of casting and annealing the metal, and a description is given of a special form of magnetometer which was designed in order to increase the accuracy of the tests. The primary object of the magnetic tests was (1) to determine the magnetic quality of the alloys in the condition as cast, (2) to find the best thermal treatment for rendering the metal of good magnetic quality, (3) to test the variation of permeability with temperature, and (4) to investigate the effects of annealing and quenching the alloys at various temperatures. The Heusler alloys are improved by annealing at 180 degrees centigrade. The best duration of the annealing process varies from a few minutes to several hours, according to the composition of the specimen. It is found that the effect on the magnetic quality brought about by cooling these alloys to the temperature of liquid air is decidedly different from what is found in iron alloys.

A paper by S. Hilpert and E. Colver-Glauert on "The Magnetic Properties of Nickel and Manganese Steels with Reference to Their Metallographical Composition" was read by Dr. Colver-Glauert.

A series of nickel and manganese steels (5 to 33 per cent nickel and 5 to 10 per cent manganese) were investigated, by quenching from various temperatures and other thermal treatment, and then quantitatively measured magnetically at room temperatures. From the products so produced, cooling experiments were carried out to —180 degrees centigrade, and the specimens were then re-heated in stages to the highest initial temperature employed, and similar magnetic investigations pursued. At high temperatures (1,200 degrees centigrade) compounds are produced which at room temperatures are strongly magnetic, the only exception being the 33-per-cent nickel-steel. This proves that the allotropic theory, which holds that magnetism rests entirely with alpha iron, is no longer tenable as regards these steels, since the slowly cooled steels are less magnetic than those quenched from high temperatures. Metallographic investigations prove that for these steels it is impossible to correlate any given structure with given magnetic properties.

S. Hilpert and T. Dieckmann presented a paper entitled "The Magnetic Properties of the Compounds of Manganese with Phosphorus, Arsenic, Antimony, and Bismuth."

A. A. Knowlton and O. C. Clifford, of the United States, presented a paper on "The Heusler Alloys."

The results of the tests show that percentage composition is relatively unimportant in determining magnetic quality as compared with heat treatment. Thoroughness of mixing is also an important factor, difficult to separate from heat treatment. It would appear that under the best conditions of mixing and chilling, the maximum possible induction, for a given manganese content, increases with increasing percentage of aluminium. Heusler and Stark's assumption that the best results are given by atomic proportions is not regarded as conclusive. Sensitiveness to heat treatment and magnetic hardness are closely dependent upon the proportion of aluminium present, while the transformation temperatures depend largely upon the percentage of copper.

Pierre Weiss, of Zurich, communicated a paper entitled "The Magnetic Properties of the Iron-Nickel, Iron-Cobalt, and Nickel-Cobalt Alloys."

When the results of quantitative investigations of magnetic properties are considered from the standpoint of the author's kinetic theory of ferromagnetism, all the metals appear to be homogeneous solid solutions. The saturation intensity of magnetism is the resultant—not the sum—of the molecular moments, and at absolute zero, when heat movements have ceased to exist, the saturation intensity gives the true moment of the molecule. By molecule the author understands the atoms which are rigidly connected with one another; the atoms may also be articulated, *i. e.*, magnetically free to assume any orientation. In the case of substances like oxygen and the salts of metals (in the solid or dissolved states) the coefficient of magnetization is inversely proportional to the absolute temperature. By multiplying this coefficient by the absolute temperature, we obtain the Curie constant, and the molecular moment (which cannot experimentally be determined in these substances) can be deduced from the Curie constant. When the magnetic moment of the nickel atom is followed through varied temperature conditions in the nickel compounds, the moment is found to be represented by multiples of a common factor, 1123.5, which the author calls the "magnéton." At absolute zero the magnetic moment of the nickel-atom is three times 1123.5, or 3 magnetons; at temperatures above the Curie point (at which the strong magnetism disappears) it is 8 magnetons, in salts 16 magnetons. The same common factor is found in the magnetic moments of the atoms of other metals and seem therefore to constitute the common elementary magnet. The assumption of the existence of these magnetons has proved useful in the study of the alloys of iron-nickel, nickel-cobalt, iron-cobalt, which the author has been investigating.

H. Du Bois opened the general discussion. He recalled the fact that in addition to the three classical magnetic metals, Weiss has prepared manganese electrolytically which is ferromagnetic. He next referred to the magneto-optical researches that were being carried out in his laboratory, and he stated that a piece of manganese steel which was non-magnetic as a lump distinctly showed the Kerr effect, the effect being variable for different patches on the mirror which reflected the light. This magneto-optical method affords a means of studying the surface patch by patch. A great many other alloys and compounds which are non-magnetic in the lump also show the same effect.

B. Hopkinson thought that the most promising direction in which to pursue a systematic study of magnetic materials with a view of throwing light on the nature of magnetism was investigation in fields of very high density. Another promising line of investigation was the relation between the saturation value of magnetization determined in that way and the temperature effect. He had shown that iron could be stretched far beyond the elastic limit in a very powerful field without changing the intensity of magnetization by so much as one per cent.

W. Rosenhain considered that while the use of fields of high intensity was of value it would obliterate the effect of many things of interest and importance in themselves.

On account of the excessive length of the meeting, the discussion had to be greatly curtailed.

Arizona Coals Promising.

Although Arizona has produced no coal on a commercial scale, it contains promising fields, which may be profitably exploited when transportation is afforded and when population and manufactures have reached a point which will provide a market for the output. The more important of these fields are the Black Mesa coal fields, in the Hopi and Navajo Indian reservations, which are included within Coconino, Navajo, and Apache Counties, and the Deer Creek field, in the extreme eastern end of Pinal County.

THE MECHANICAL ENGINEERS AT CLEVELAND.

Spring Meeting of the American Society.

The subjects considered at the spring meeting of the American Society of Mechanical Engineers, held at Cleveland, O., May 28, 29 and 30, comprised steam engineering, gas power, metallurgy, hydroelectric-plant practice, gold-dredging, and strength of tubes. The papers of greatest electrical interest were "The Present State of Development of Large Steam Turbines," by A. G. Christie; "The Reduction in Temperature of Condensing-Water Reservoirs Due to Cooling Effects of Air and Evaporation," by W. B. Ruggles; "Results of Test on the Discharge Capacity of Safety Valves," by E. F. Miller; "Speed Regulation in Hydroelectric Plants," by William F. Uhl; "A Discussion of Certain Thermal Properties of Steam," by G. A. Goodenough; "Bituminous Coal Producers for Power," by C. M. Garland.

Steam-Turbine Development.

Mr. Christie's paper dealt with the present state of development of the leading types of large steam turbines, which for purposes of the paper were divided into two classes; (*a*) fundamental types, and (*b*) modified or combined types. Included in class (*a*) are (1) turbines of the Parsons type, or those working on the reaction principle; (2) the Curtis type, working on the impulse principle with high steam velocities and few stages; (3) the Rateau turbine, consisting of a number of simple impulse wheels in series on the same shaft and separated from one another by diaphragms carrying the nozzles. It operates with lower steam velocities than the Curtis and therefore has more stages. Under class (*b*) may be included turbines with modified Parsons, Curtis, and Rateau constructions and turbines with combinations of Curtis-Parsons, Rateau-Parsons, Curtis-Rateau and Curtis-Zoelly construction. The Zoelly turbine is classed as a modified Rateau. In the paper the weak elements of the fundamental types are discussed fully and the advantages of the new constructions are pointed out. Details of the new constructions are illustrated by sectional drawings, and a full description of these details forms a considerable section of the paper. The author goes into the methods of blading, and contrasts the practice of the different builders. Not the least interesting part of the paper is a tabular comparison of the practice of different makers in turbine construction; this table exhibits every class of data which it is desirable to have at hand in analyzing turbine construction. Another valuable table forming part of the paper is that showing the economy tests of a number of different types of turbines, including Curtis-Parsons, Parsons, Curtis-Rateau, Curtis-Zoelly, Rateau, Curtis, and Zoelly turbines of many different makers. The turbines listed ranged from 1,200 to 12,000 kilowatts in capacity and ran at speeds ranging from 750 to 3,000 revolutions per minute. The table exhibited the following quantities: pounds of steam per kilowatt-hour, British thermal units per kilowatt-hour, heat utilized per pound of steam, heat available per pound of steam, and the efficiency ratio. The paper closed with a discussion of the probable trend of steam-turbine development, in which the proposition was offered that the combined types, as outlined above, would soon supersede the fundamental types, which, while of high efficiency, are of high manufacturing cost. Turbines will probably be made shorter, with stiff shafts which will eliminate many blading troubles. Peripheral speeds will be increased, and it is thought that this will increase the efficiency. The greatest hope of increased efficiency lies in extensive study of the action of the steam during its passage through the moving and stationary blades, of the effect of form of blades, passages and casings and of various forms of baffles and balance pistons to prevent leakage.

The discussion on this paper was especially full. Mr. De Laval told of a Swedish turbine of recent design which was radical in its method of utilizing the velocity of the steam. The principal difficulty of the reaction turbine is the inability of the designer to produce practical blade speeds with a low number of blades and without long rotors. To these may be added the troubles of distortion under superheat, and the economy is therefore less than that of the impulse turbine. The Swedish turbine, which is a radial-flow, reaction machine, is designed to overcome these troubles. Steam enters between two disks, and passes from the center to the circumference between concentric blading rings. The disks revolve with their shafts at high speed, but in opposite directions, the generator being attached to the shaft. The blade speed is therefore double that of the ordinary reaction turbine, and the turbine is of small dimensions and low floor area per horsepower. The first turbine of this type to be built was of 500 kilowatts capacity, and ran at 3,000 revolutions per minute. It showed an efficiency of 71.8 per cent, and a steam consumption of 8.75 pounds per brake-horsepower-hour. The steam pressure was 175 pounds per square inch absolute, the superheat 250 degrees Fahrenheit and the vacuum 28.5 inches. Single-rotation turbines, designed on the same principle, showed an efficiency somewhat lower and a steam consumption about 10 per cent greater. The highest record of turbine performance given in the paper was that of a Curtis-Parsons, the efficiency being 71.8 per cent, at 1,500 revolutions, with a steam pressure of 156.2. The steam consumption was 13.82 pounds per kilowatt-hour. A Swedish turbine of the type described, of 1,000 kilowatts capacity, had an efficiency of 74.7 per cent, based on the steam at the front of the throttle, and of 76.9 per cent based on steam behind the throttle. The steam pressure was 162 pounds, the revolutions per minute 3,000, and the steam consumption 11.55 pounds per kilowatt-hour or 8 pounds per brake-horsepower-hour. The critical speed of this turbine is 6,300 revolutions, and therefore it is not necessary for the turbine to pass through the critical speed. The general arrangement of a unit of this type is a generator at each end and the condenser underneath.

C. P. Crissey gave a classification of turbines. He gave the usual division as (I) Reaction and (II) impulse. He then subdivided the impulse turbine into: (*A*) turbines with one velocity stage in each pressure stage; (*B*) turbines with two or more velocity stages in each pressure stage; (*C*) turbines in which all pressure stages did not have an equal number of velocity stages. Impulse turbines were further subdivided according to construction into: (*a*) turbines in which the steam leaving the last row of moving buckets in any stage passes directly to the next set of nozzles without loss of velocity; (*b*) turbines in which the steam leaving the last row of moving buckets in any stage passes into the casing and after losing nearly all its velocity enters the next set of nozzles; (*c*) turbines in which the steam leaving the last row of moving buckets of any stage is utilized in some succeeding stage according to the method of (*a*) or (*b*). As an example in the use of this classification Mr. Crissey gave the following: Rateau turbine, class *Ab;* Zoelly turbine, class *Ab;* Curtis (General Electric) turbine, class *Bb;* Curtis (A. E. G.) turbine, class *Cc.*

E. D. Dreyfus advocated the adoption of a code by which turbines could be rated, and in support of this quoted the editorial in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of October 14, 1911.

J. A. Moyer added to the tabulation of tests given by the author, the tests of the Sulger impulse-reaction turbine reported by Professor Stodola in the *Zeitschrift des Vereines Deutscher Ingenieure* of October 28, 1911. The load at which the highest economy was shown was 2,058 kilowatts, the steam consumption per kilowatt-hour was 15.21 pounds, the steam pressure was 178.1 pounds absolute, the revolutions per minute 1,501, superheat 182 degrees Fahrenheit and the vacuum referred to a 29.92-inch barometer was 28.41 inches. Calculated from these data, the British thermal units per kilowatt-hour were 18,800, the heat utilized per pound of steam was 224.5 units, the available heat per pound of steam 380.1 units and the efficiency ratio, according to the Rankine cycle, was 59.1 per cent. The generator efficiency was low. This turbine had the disadvantage of three rows of moving blades

and two rows of stationary blades instead of the modern Curtis construction of two rows of moving blades and one row of stationary blades per stage. Mr. Moyer stated that tests which show an efficiency on the Rankine cycle of more than 68 per cent should be taken with caution, and advised reservations in accepting some of the figures in the paper.

Temperature of Condensing Water.

Mr. Ruggles's paper on the reduction in temperature of condensing water reservoirs described a series of tests made to determine the heat radiation from a cooling reservoir of about 6.5 acres at the plant of the Crescent Portland Cement Company at Wampum, Pa. The amount of heat delivered to the reservoir from the engines and compressors of the company's plant was measured by hourly readings of power and vacuum, and the reduction of temperature due to pumping in fresh water from the Beaver River and by rain was also measured. By frequent readings of the temperature of the tail water, intake water and air, the cooling effect of the air on a unit surface of water per unit difference of temperature was easily determined. The average horsepower developed in the engines during the 21 days of the tests was 2,446. The results were as uniform as could be expected; the heat lost per square foot of surface was slightly less per degree difference of temperature in cold weather than in warm, evidently due to the increased evaporation in warm weather. The average humidity for the different weeks of the tests was 58.5 in May; 62.3 in July; and 71.2 in November. The heat absorbed by the air and by evaporation per square foot per hour per degree difference of temperature of air and water was 3.69 British thermal units in May; 3.71 units in July and 3.22 units in November. The tests indicate that under ordinary conditions in the northern half of the United States, for engines using 15 pounds of water per horsepower-hour and a vacuum of 26 inches, a reservoir of 120 square feet per horsepower should be provided.

J. E. Cardullo criticized the omission in the paper of figures showing the amount and direction of the wind, saying that the evaporation might be from 2 to 4 per cent greater with a heavy wind. A wind crosswise of the pond would cause the evaporation to be from 50 to 100 per cent greater than a wind in the long direction. He said a cooling pond must be designed for summer conditions, with little or no wind.

W. T. Donnelly said that the relative humidity was the most important factor governing the evaporation. Its effect was almost as great as that of wind. The explanation of the greater evaporation in winter was the lower humidity of the air.

Safety Valves.

In the paper on safety valves read by E. T. Miller are given the results of a series of tests made on the discharge capacity of 3-inch and 3.5-inch locomotive pop safety valves at varying lifts under 200 pounds boiler pressure, also results of tests on the discharge capacity of 3-inch and 3.5-inch inspector valves of the flat-seated and bevel-seated types under 100 and 150 pounds gauge pressure. In all of the tests the steam was condensed in a surface condenser and the condensation weighed. The tests were run from 30 minutes to one hour in duration so that errors of weighing were reduced to a minimum. In all of the tests the valve was set a definite distance from its seat and held rigidly, the spring of the valve having been removed.

There was no discussion on this paper.

Speed Regulation in Hydroelectric Plants.

Another paper which evoked no discussion was that of William F. Uhl, entitled "Speed Regulation of Hydroelectric Plants."

To obtain satisfactory speed regulation in a hydroelectric plant, it is usually insufficient to provide the turbine units with well designed governors. Where the turbines are of the open flume type, and the velocity of approach does not exceed three to four feet per second, satisfactory regulation depends upon the flywheel effect of the rotating masses only, and the formula for calculating the speed variation is given. Where incased turbines are employed, pressure variations occur which modify the results obtained from this formula. The ratio of the length of the turbine penstock to the head is a measure of the effect of these pressure variations. When the ratio is too great to obtain satisfactory results, the design of parts of the plant must be modified, or appurtenances such as pressure regulators and standpipes must be employed to reduce the pressure variations. Tables are attached which give the pressure variations for various governor regulating times when the ratio and the penstock velocity are known.

Thermal Properties of Steam.

C. H. Goodenough's paper discussing the thermal properties of steam drew forth considerable criticism. In the paper the trustworthy data furnished by the Munich experiments on various properties of steam are used as the basis of a general theory. The characteristic equation proposed by Linde is slightly modified and by means of the Clausius thermodynamic relation a formula for specific heat is derived. The resulting specific-heat curves are subjected to various tests and the validity of the formula is apparently established. With the aid of the general equation of thermodynamics, explicit expressions for the heat content, energy, and entropy of superheated steam are deduced. The values obtained from these formulas are compared with corresponding values in the Marks and Davis table, and substantial agreement is shown.

L. C. Heck attacked the paper, saying that a graphical comparison showed differences between the writer's tables and those of Marks and Davis. He condemned the failure of the author to satisfy Clapeyron's relation, showing that volume and heat curves disagree throughout.

F. E. Cardullo deplored the tendency of some writers to regard thermodynamics as a branch of applied mathematics and advocated approaching the problem from the physical standpoint. He showed by a diagram that the heat imparted to the steam consisted of three parts—that expended in increasing the kinetic energy of the molecules, in separating them, and in breaking them up into their constituent atoms. It is possible to compute each of these separately and to combine them into a rational expression for the specific heat. The most accurate method of determining the constants of such an equation is from the Joule-Thomson effect, and it is desirable that the problem of the properties of steam be approached by this method.

Gas Power.

Three papers were presented at the meeting of the Gas Power Section, entitled respectively "Problems in Natural Gas Engineering" by Thomas R. Weymouth, "Some Tests on Carburetors" by George W. Munro, and "Bituminous Coal Producers for Power" by C. M. Garland.

The last paper describes the apparatus and general arrangement of bituminous coal producers as designed for power. The scrubbing apparatus is described in detail, data given on its efficiency, and the amount of solid matter delivered in the gas. Data on the efficiency of the plant, composition of the gas, and operating costs, together with brief discussions on these items are also included. Approximate figures for the first cost and operating costs at full load for a 1,200-brake-horsepower plant are given as follows: equipment, including building, coal-handling apparatus, etc., $15.35 per engine brake-horsepower; interest, depreciation, taxes, etc., 0.02280 cent; maintenance and repairs, 0.00270 cent; supplies, 0.00185 cent; labor, 0.04370 cent; fuel, 0.06200 cent; or a total of 0.133 cent per brake-horsepower-hour. The figures are based on a cost of $1.00 per ton of coal. In regard to the relative economy of natural and producer gas, the author stated that producer gas is probably more economical than natural gas at 30 cents per 1,000 cubic feet.

The utilization of the heat of the exhaust under boilers was the subject of considerable discussion. It was stated that the temperature of the exhaust should not fall below 300 degrees Fahrenheit. A member stated that if boilers were made of cast iron they would corrode rapidly if the temperature fell below 212 degrees. It was stated, however, that some of these boilers have been in use for three or four years and no repairs have as yet been needed. The size of producer plants for power purposes has not yet reached the 5,000-10,000-kilowatt-unit stage, the reason being the comparatively low cost of coal. The largest producer plant in this country for power purposes has a capacity of 3,000 kilowatts.

New Electrical and Mechanical Appliances

New Consolidated Tungstolier Ready-to-Hang Fixtures.

For some years the Tungstolier Company, of Conneaut, Ohio, has specialized in fixtures so constructed and packed that risk and trouble of handling was reduced to the minimum. It was thought that the designers had gone about as far in this direction as was practically possible, but in the new "Consolidated" Tungstoliers, a number of improvements have been made.

For shipment the new fixtures are packed in cartons, the four-light unit requiring a boxboard container only 6 by 6 by 22 inches over all. These cartons are sealed securely and the label shows the catalog number, length, spread, number of lights and finish. As

Fig. 1.

the unit comes from the carton (Fig. 1) it is absolutely complete, the shells, sockets and holders being attached. There are no missing parts, for nothing is packed separate.

The labor of assembling is simpler and takes less time than attaching a single socket to an ordinary fixture. The bottom shell is removed by unscrewing a thumbscrew; then the binding screws are loosened to permit the arms to be inserted in the body frame (Fig. 2). The arms are slotted to engage a raised ridge in the body plate which clamps them rigidly and holds them immovable when the binding screws are tightened (Fig. 3). The body shell is then attached with thumbscrew and the unit is complete, as shown in Fig. 4.

There are, of course, many small refinements designed to add to the practical value of the unit as a stock proposition for the electrical contractor or fixture dealer. For example, the threaded terminal which locks the shell in

Fig. 2.

place has a threaded stud which may be removed for a pendent switch cord, if desired. Another point is that the four binding screws which fasten the

Fig. 3.

body plates together and secure the arms in place, are flanged on the ends so that they cannot drop out. A careless workman cannot waste time by running the screws entirely out of the plates and deranging the body or losing screws. The flange makes the unit fool proof. No iron pipe is used in the Consolidated Tungstoliers, which saves about 20 per cent in weight with consequent saving in freight or expressage. This line of fixtures is included in the list of approved fittings of the Underwriters' Laboratories.

Seven types of round-tube Consolidated Tungstoliers have been placed on the market and five types of square-tube units. These include a close ceiling single-light unit, single-light side-wall unit, and one, two and four-light ceiling units in both styles of tubing, with three and five-light ceiling units also available in round tubing. Cloister, brush brass and nickel finishes are

Fig. 4.

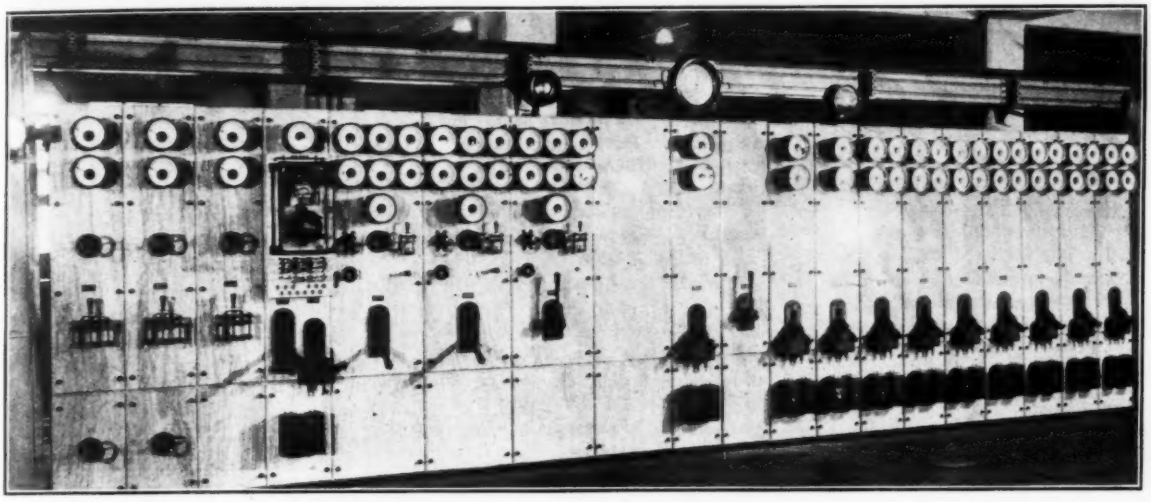
standard and are stocked at the factory for immediate shipment; other ordinary finishes are supplied at no extra charge on special rder.

Consolidated Tungstoliers make an ideal line for the electrical contractor. The compactness of the line, the impossibility of damage to shells or finish, the fact that there can be no lost parts and that the labor of assembling is almost nothing, combined with the low price, makes it very profitable for the contractor who has no facilities for entering the regular fixture business, but who has frequent opportunity to install standard units for commercial and residence use.

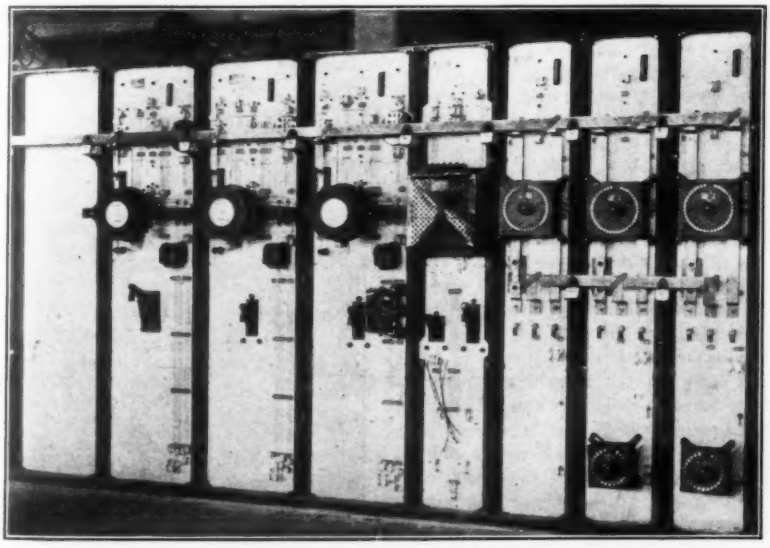
Electric trucks are coming into extensive use by large express companies, particularly in eastern cities.

Remarkable Space Economy Effected By Use of New Type of Meters.

Space economy is a very essential factor these days when it comes to building a plant or laying out plans for additional machinery in an existing plant. Particularly is this true in the large cities where real-estate values are high, but the advantages of saving space are always appreciated under any conditions. Any equipment, therefore, that effects this economy and which at the same time does not sacrifice any of its essential or advantageous features must necessarily win for itself a place in modern power-plant construction.



Switchboard for Mare Island Navy Yard, San Francisco, Cal.



Rear View of Mare Island Switchboard.

No better example of this trend of modern construction has been afforded recently than by the line of Westinghouse seven-inch-diameter switchboard indicating meters, which in the installation illustrated herewith effected a saving of 25 per cent in the floor space occupied by the switchboard. This board illustrates a rapidly growing tendency on the part of designing engineers to economize in switchboard space by the use of meters occupying a minimum switchboard area, especially now that such meters can be obtained with a maximum scale length and readibility.

This board is installed at Mare Island Navy Yard, San Francisco, Cal., and consists of 19 panels of blue Vermont marble. All of the panels are either 16 or 24 inches wide, obviating the use of the larger panels usually found in a board of this size.

There are 63 meters included in the equipment, the 16-inch panels having two meters mounted thereon in a horizontal line, and the 24-inch panels have three meters mounted in a horizontal line. The total length of the board is 28 feet. Had the ordinary nine-inch meters been used, the length would have been 25 per cent greater, involving consequently greater expense and floor space. The use of the smaller meters in this case meant a saving, therefore, of seven feet of floor space, 56 square feet of marble, and much less ground to be covered by the attendant.

The board controls two 500-kilowatt and one 1,000-kilowatt 2,300-volt, three-phase, 60-cycle generators with exciters. Provision is made for the future installation of a 2,000-kilowatt generator. A type TA voltage regulator is mounted on the panel containing the control apparatus for the induction motor driving one of the two exciters.

A view of the rear of the board shows the neatness of the arrangement of wiring made possible by the use of remote-control apparatus with consequent absence of heavy wiring, busbars and oil circuit-breakers from the back of the board.

Another point of particular interest is the mounting of the watt-hour meters on the back of the board where they are very accessible and at a convenient height to be read. The board and instruments were supplied by the Westinghouse Electric & Manufacturing Company.

New Type of Oil.

The oil from the large well recently drilled by the Myles Mineral Company at Pine Prairie, La., is remarkable, according to an analysis made by the United States Geological Survey, in that it contains no asphalt, gasoline, or paraffin wax. The crude product contains a very large percentage of illuminating oil. In composition the oil stands about halfway between the oil of the Gulf and the Caddo fields.

A Service-Entrance Hood With Some Unique Features.

A new service-entrance hood just placed on the market by the Bonnell Manufacturing Company, of Cleveland, Ohio, has several unique advantages. It is listed by the manufacturer as a service-entrance Adaptibox, and its claims of superiority are the adaptable features of the connector lugs and the porcelain cover.

As will be seen from the illustration, the unit consists of three parts: the hood, the connector lug and the cover. The porcelain cover permits the use of any number of wires from one to nine, the center hole being surrounded by eight knock-outs so that by simply punching out the required number of seals, openings are provided for any desired combination of circuits. In addition to this special cover, the regular Adaptibox covers Nos. 4 and 84, are available for use on these hoods. The connector lugs are interchangeable, being standard Adaptibox lugs. Two sizes of hood are listed, each of which accommodates two sizes of conduit lug. The smaller hood takes

Service-Entrance Hood.

one-half to three-quarter-inch and the larger one to one and one-quarter-inch conduit.

The advantages of an entrance hood of such flexibility are obvious. Simply from an investment standpoint, the service-entrance Adaptibox is desirable as it is never necessary to have more than one each of the two sizes in stock and these will meet every possible contingency. The Bonnell Manufacturing Company reports a very satisfactory business in the line of Adaptiboxes. These fittings have such flexibility and enable the contractor to meet such a wide range of conditions with such a paltry investment in stock that they are meeting ready welcome by the trade.

Pittsburgh & Lake Erie Adopts Telephone Train Dispatching.

One of the latest railroads to join the list of those using the telephone for the handling and control of trains is the Pittsburgh & Lake Erie. This railroad has three branches, each of which terminates at Pittsburgh, the branches extending to Youngstown, O., a distance of about 70 miles, to Connellsville, Pa., about 60 miles, and to Brownsville, Pa., about 55 miles. As Pittsburgh is the natural center of the system, the dispatcher will be located at that point. Two complete dispatcher's equipments will be used, so that two calls may be placed simultaneously on either end of the line. Western Electric apparatus will be employed.

Schuchardt Phase-Rotation Indicator.

In making repairs to polyphase motors or other polyphase machinery or to the wiring leading to them, great care must be exercised to maintain the relative order of the phases unchanged, as otherwise the reversal of a pair of leads or of one of the phases, either in or outside of the machine, will result in reversing the direction of rotation of the machine. Neglect of this precaution has occasionally resulted in serious accidents, especially on electric elevators.

To guard against this difficulty the phase rotation of the circuit must be determined. This can be done by temporarily disconnecting the parts and placing phasing lamps in the circuit, but

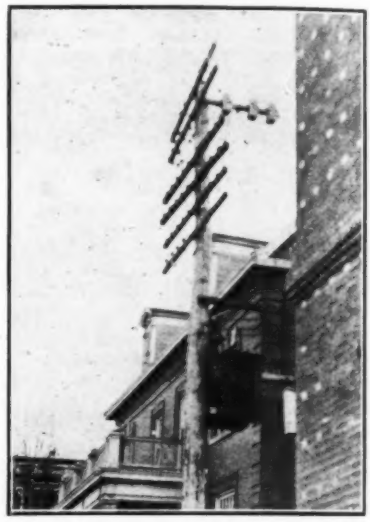
Schuchardt Phase-Rotation Indicator.

more quickly by connecting a small polyphase induction motor across the line and noting its rotation. To overcome the inconvenience of both these methods, a light and compact phase-rotation indicator has been invented by R. F. Schuchardt, 517 Aldine Avenue, Chicago, who is well known as the electrical engineer of the Commonwealth Edison Company.

The Schuchardt indicator, as shown in the illustration herewith, is mounted in a neat instrument box. It has three binding posts for three-phase lines and four for two-phase circuits. Within the instrument is a set of solenoids properly connected and arranged with a plunger passing through their axes and comprising the arc of a circle. This plunger is mounted in bearings and carries an indicating needle that moves over the chart at the head of the instrument. The needle and chart show whether the rotation of the phases is in the order 3-2-1 or 1-2-3, corresponding to the numbers on the binding posts. The instrument is very much lighter than an induction motor and is instantaneous in indication.

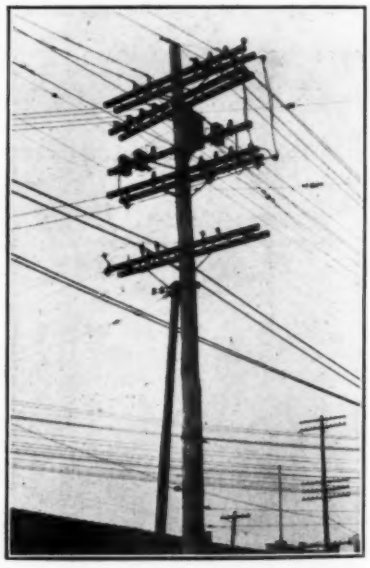
Matthews Fuse Switches.

Dangerous grounds, short-circuits, broken wires and similar difficulties have frequently caused serious accidents on overhead distributing systems because there was not provided a reliable cutout device to separate the



Fuse Switches on Line Side of Three-Phase Transformer.

damaged circuit from the power feeder. The Matthews fuse switches are specially designed to afford this needed protection. They are of double utility because they combine in one device a



Fuse Switches Between Overhead Feeder and Underground Lateral.

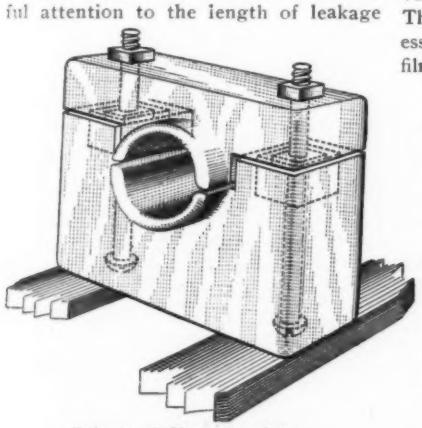
primary fuse and a disconnecting switch.

The value of this device is shown by the great number installed on important systems. The accompanying two illustrations show the manner of installing the fuse switch on some poles

of the Union Electric Light & Power Company, St. Louis, Mo. One of these shows a set of fuse switches provided with 18-ampere aluminum fuses that protect the 4,400-volt primary of a 75-kilowatt three-phase transformer which supplies current to the motor-generator sets in the factory of the Brown Automobile Company. Another illustration shows fuse switches between a 4,400-volt aerial three-phase line and an underground lateral feeding the Missouri, Kansas & Texas Railroad freight depot. These fuse switches are manufactured by W. N. Matthews & Brother, St. Louis, Mo.

Porcelain Clamp Insulator for Switchboard Use.

The Fairmount Electric & Manufacturing Company, Philadelphia, Pa., has recently placed on the market a very efficient type of porcelain clamp insulator, shown in the accompanying illustration. This insulator has been designed particularly for high-voltage switchboard construction, but lends itself with equal advantage to low-voltage work, where a high grade of excellence is the first consideration. The design has been worked out with careful attention to the length of leakage



Fairmount Clamp Insulator.

paths to ground, clamping arrangements and ease of installation.

The clamping members comprising the insulator grip the cable uniformly between two circular tube-like surfaces approximately two inches in length, as indicated by the projections on each side of the clamp. All edges are carefully rounded to avoid any possibility of injuring the cable covering due to forcing sharp corners or grooved inner surfaces into the insulation.

This type of construction has a further advantage in practically doubling the surface leakage path to ground. It is further evident that on account of the larger clamping surface presented, the wire will be held firmly with much less pressure per unit area of contact surface.

The leakage path from conductor to bolts, between the insulations has also been carefully designed so that, at this point, the path to ground is approximately of the same length as the path over the surface of the porcelain to the insulator support.

Another important feature included in the design is the method used in bolting the insulator to the switchboard framework. In this type of construction the lower half of the insulator may be bolted to its support and properly aligned before the wire or insulated bus is fastened in position.

This is particularly advantageous in switchboard work where the busbars and circuit taps consist of heavily insulated solid conductors which must be straight before being placed on the insulators. In addition the clamping of the cable is rendered entirely independent of the insulator fastenings and the pressure on the wire can be adjusted to suit the strain placed upon the cable and the character of the insulated covering.

Electrolytic Lightning Arrester for Railway Service.

The ideal lightning arrester for low-voltage circuits is the electrolytic type. This type of arrester has two very essential characteristics, due to a film of hydroxide of aluminum deposited on aluminum plates or trays, that enables it perfectly to fulfill the conditions required. These essential characteristics are: (1) that it automatically offers a very high resistance to currents at normal voltages and a very low resistance to currents above a certain critical voltage; (2) that it possesses the properties of a condenser, offering high effective resistance to currents at low frequency, and low effective resistance to currents at the high frequencies that are prevalent in lightning discharges.

The decrease in resistance occurs very rapidly at a certain critical voltage, so that for current at double the normal voltage, the film offers practically no resistance to the flow of current, but when the excessive voltage ceases, the resistance is instantly restored and no power current follows the discharge nor is there any arcing.

A design of an electrolytic arrester for railway work has recently been placed on the market by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. It is built in two styles, for 600 and 1,500-volt circuits.

The arrester consists of a tank of oil in which are placed, on properly insulated supports, a nest of cup-shaped aluminum trays. The spaces between the trays are filled with electrolyte, a sufficient quantity for one charge being furnished with each arrester. The top tray is connected with the line through a 60-ampere fuse, and the bottom tray is connected to the tank which is thoroughly grounded by means of a lug. A fuse of the inclosed type is mounted on the cover of the arrester.

A small charging current flows through the trays continuously and keeps the films on the trays built up, so that no charging is required. This charging current is not, however, of sufficient value to raise the temperature appreciably.

The effectiveness of a lightning arrester is largely affected by the resistance it offers to the discharge, and in an electrolytic arrester this depends on the area of the aluminum plates. The degree of protection, therefore, is largely dependent on the aluminum-plate area, while the integrity of the arrester under hard service and varying line voltage demands large thermal capacity and radiating surface in order to prevent any temperature rise.

The Westinghouse type A arrester is built with ample immersed plate or tray surface, using the same trays employed in the high-voltage alternating-current arresters. The immersed area of each tray is 100 square inches, which is over twice as large as that in any other direct-current arrester of this type. The shape

Electrolytic Lightning Arrester.

and the arrangement of the trays is such that any gases generated by the discharge can pass out readily without disturbing the electrolyte between the trays. The volume of oil and cooling surface are also correspondingly large, rendering this type a large substantial arrester for connecting to busbars in direct-current plants.

Wireless to South America.

A direct wireless service between the continents of North and South America will be made possible through the equipment of stations at New Orleans, at Swan Island in the Caribbean Sea, and at Santa Marta in the United States of Colombia. These stations will be equipped by the Marconi Wireless Telegraph Company of America, for the United Fruit Company.

Condensers on Lighting Circuits.

The accompanying diagrams show two methods of applying the Helsby condensers in connection with metal-lamp circuits—parallel and series respectively. In the former (Fig. 1) in which the circuits are in parallel, each circuit consists of a lamp and a condenser in series. In the latter (Fig. 2) which is termed the series system, a number of lamps of low voltage, 8, 12 and 16 volts, are connected in series with each other and a condenser, the individual lamps being controlled by short-circuiting switches. System I, it is claimed, is easily applied to houses already wired, and can be adopted for any number of single lamps or groups of lamps as may be convenient, and lamps not arranged for control by a condenser would be left to run at their original voltage. Owing to its flexibility the system can be applied at points where the greatest saving is to be effected; for instance, where low-candlepower lamps are sufficient, without interfering with points where high-candlepower lamps, suitable for the full supply pressure, are required. The British Insulated & Helsby Cables, Limited, London, Eng., which has made the condensers under Ashton's patents, at Helsby, quotes as an instance of the foregoing the circumstance that a 10-watt lamp gives quite sufficient light for small entrance halls, bath rooms, small bedrooms, etc., the use of electric lighting in which places has been retarded owing to the lack of efficient low-candlepower lamps for higher voltages. The parallel system involves a minimum disturbance of the wiring, and the condenser may be fixed under the floor above the ceiling rose, or on the wall near the switch. In the small sizes a cylindrical type is made, provided with an adapter and a lampholder, which permits of a condenser being inserted between any lamp and its original holder. The saving in current is estimated at sufficient to exceed the cost of the condenser during the life of the first lamp.

In System II all the lamps are connected in series with each other and with the condenser, and connected in circuit across the mains. Switches are fixed in parallel with the lamps, so that when a switch is closed the corresponding lamp is short-circuited. If the sum of the voltages of the lamps in use at the same time does not exceed forty per cent of the supply voltage, each lamp practically gets its correct current, however many lamps are switched on. Full advantage of the protection afforded to the wiring by the condenser is obtained by placing the condenser as near as possible to the fuses of the supply circuit.

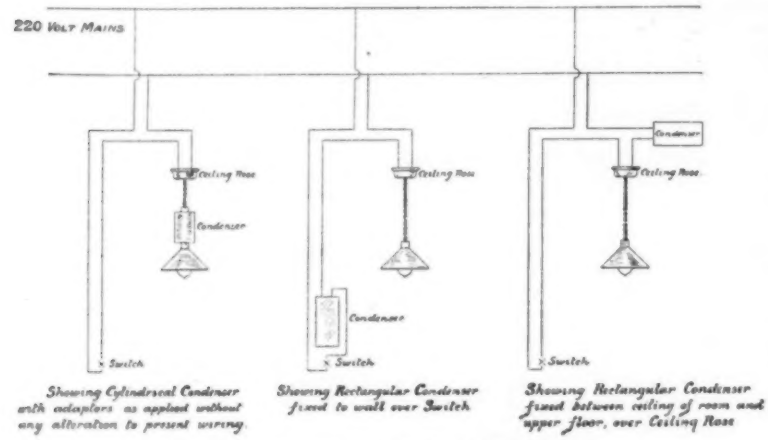

220 Volt Mains
Ceiling Rose
Condenser
Switch
Showing Cylindrical Condenser with adaptors as applied without any alteration to present wiring.
Showing Rectangular Condenser fixed to wall over Switch.
Showing Rectangular Condenser fixed between ceiling of room and upper floor, over Ceiling Rose

Fig. 1.—Condensers in Multiple Lighting Circuits.

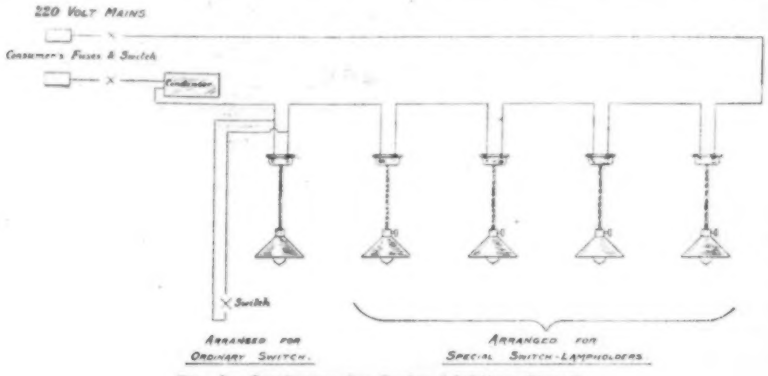


Fig. 2.—Condenser for Series Lighting Circuit.

It is considered that for blocks of small flats or artisans' dwellings, where it does not pay to install meters, and where a "contract demand tariff" is adopted, the condenser prevents waste of current by the improper substitution of higher-candlepower lamps.

Figures have been issued showing the economical advantage of the use of condensers in a small six-room house, but the system is equally applicable to large installations by subdividing each floor or other suitable block into separate series circuits, each with its own condenser. In such cases the supply engineer finds that owing to the leading current taken by the condenser neutralizing the magnetizing current taken by the transformers and induction motors, the power-factor of the whole system is improved. Further, the condenser in the series system acts as a current-limiting device, and encourages the consumer to keep within his assured maximum demand as fixed by the condenser installed, as the consumer cannot take more current than that for which the condenser is rated.

Electric Vacuum Street Cleaner.

A vacuum cleaner has been adopted to clean the tracks of the street railways in Strassburg, Germany. It resembles a box car and, in addition to the ordinary traction motor, has an electric motor which operates a vacuum cleaner within the car. The dirt on the track is sprayed with water, scratched and drawn up into the closed car by the suction apparatus. Twenty-five miles of roadbed are thus effectively cleaned daily by a vacuum cleaner operated by one man and which does the work of 17 men working in the ordinary way.

Steel Trolley Wire.

Steel trolley wire has been adopted on a few electric railways, but it has not been in use for a sufficient time to determine its relative life and behavior in service as compared with copper wire. The steel wire is hard-drawn from billets in a way like that employed for copper wire. The relative conductivity of steel and copper wire is approximately 1 to 7.

Wireless in Portugal.

The erection of a number of wireless stations in Portugal was announced some time ago. It has been decided to equip these stations with the Marconi system, and in future this system will also be used on all Portuguese warships. Heretofore the Telefunken system has been in use in the army and coast fortifications.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

SHULLSBURG, IOWA. — The Booster Club has started a movement for cluster lights. C.

PRESCOTT, IOWA.—A franchise has been granted to the Lee Electric Company of Clarinda. C.

SHARON, PA.—A special bond issue of $85,000 has been issued to build a municipal light plant.

BIG FALLS, MINN.—A franchise has been granted to Dahl & Shipley for an electric light plant. C.

OELWEIN, IOWA.—The Oelwein Light, Heat & Power Company will make extensive improvements in its local system. C.

GLADBROOK, IOWA.—J. P. Walters, of the Toledo Light and Power Company, has been granted a franchise for street lighting. C.

WINNFIELD, LA.—A franchise has been granted to Harry W. Wright, of this place, to build an electric light and waterworks plant in Jena.

OCEAN SPRINGS, MISS.—H. F. Russell and L. A. Lundy have been granted a franchise to build an electric light plant, work to be started by June, 1913.

OSCEOLA, MO.—Osceola Light & Water Company has been incorporated with a capital stock of $25,000 by C. R. Hunt, A. M. Seddon and C. F. Cury.

LOCKHART, S. C.—The Lockhart Mills contemplates the construction of a hydroelectric plant on the Broad River. The concern is capitalized at $1,300,000.

WAUCHULA, FLA.—The Wauchula Manufacturing Company is preparing to install an electric power plant with which to light this town with electricity.

OAKFIELD, WIS.—W. E. Bristol is taking bids for the erection of a complete light and power plant, oil engine, generator, switchboard and storage battery. C.

OSCONDA, MICH.—A tentative contract has been entered into with the Michigan Power Company to furnish a high-power transmission line in Osconda and Au Sable.

YONKERS, N. Y.—At a meeting of the Lighting Committee of the Merchants' Association it was decided to add 180 electric lamps along certain streets of Yonkers.

CEDAR BLUFFS, NEB.—J. H. Meakrang, village clerk, announces that a contract will be let about July 1 for the construction of an electric light plant to cost $7,000. C.

BRUNSWICK, MD.—The Brunswick Town Council will spend $20,000 for electric lights. The question of building a municipal electric light plant is now being contemplated.

ADAMS, N. Y.—Adams Electric Light Company has been incorporated with a capital stock of $20,000 by Mark B. Steele, Jennie F. Steele and Ina D. Steele, all of Adams, N. Y.

AMERICAN FALLS, IDAHO.—The American Falls Power Company has awarded a contract to the James A. Green Company for the erection of a power plant to cost $250,000. C.

MONTGOMERY, ALA.—The Alabama Interstate Power Company contemplates the erection of a storage reservoir to hold millions of gallons of water at Cheroke Bluffs, at a cost of $5,000,000.

MACEDON, N. Y.—Macedon Power Company has been incorporated with a capital stock of $15,000 by Edwin Youngs and Minnie A. Youngs, Macedon, and George L. Colgate, Rochester, N. Y.

BOONE, IOWA.—The Boone Electric Company expects to soon be supplying electric power to Madrid, Luther, Woodward and several other communities. This will necessitate stringing wires to these places.

GREENSBURG, KY.—The Moss Milling Company has been awarded a franchise for the operation of an electric light system, and is making contracts for the machinery and material to be used in its installation and operation. G.

ASTORIA, ORE.—Articles of incorporation have been filed of the Elk Creek Light & Water Company, with a capital stock of $5,000. The incorporators are Orrin Kellogg, Otto J. Kraemer and Lester W. Humphreys.

GOSHEN, IND.—Goshen Public Service Company has been incorporated with a capital stock of $10,000 to supply water, light, heat and power in this city. The directors are M. O. Payne, C. R. Scott and W. L. Stonex.

ST. LOUIS, MO.—St. Louis County Electric Light, Heat & Power Company has been incorporated with a capital stock of $15,000. The incorporators are David P. Leahy, Philip A. Smith, Richard J. Baldwin and Stephen J. Leahy.

PORT CLINTON, O.—The W. S. Ferguson Company, Cleveland, O., is preparing plans for a $500,000 power plant to be erected at this place by the American Gypsum Company. The engineers state that they will be ready for bids very soon.

ARTESIA, N. M.—John C. Keyes, of Oklahoma City, Okla., who has purchased the plant of the Artesia Electric Light & Power Company, plans to enlarge the plant and construct electric power transmission lines to the farms of that section. D.

FRIENDSVILLE, MD.—The Youghiogheny Power Company of Maryland, which is to build a hydroelectric power plant and dam across the Youghiogheny River at this place, plans to extend power transmission lines to Pittsburgh, Pa., with an initial capacity of 40,000 horsepower. About $4,000,000 is involved in the proposed improvement.

ANNAPOLIS, MD.—Annapolis Public Utilities Corporation has been organized here with a capital of $300,000 for the purpose of erecting and operating electric lighting and power plants, etc. George Winship Taylor and L. Vernon Miller, of Baltimore, are interested in the company.

MORRISTOWN, TENN.—The Commercial Club of this place is planning the organization of a company for the construction of a hydroelectric plant in Eastern Tennessee. The construction of an interurban line connecting the cities of that part of the state is one of the plans contemplated by the commercial organization.

WELLSVILLE, O.—A committee composed of J. L. Porter, P. M. Smith, Charles Boyd and Albert Catlett has been appointed to report on the cost of erecting a municipal lighting plant and the probable cost of operation per light as compared with the rate at which current is now purchased from the Tri-State Electrical Company. B.

CHARLESTON, W. VA.—Official announcement has been made that extensive hydroelectric plants will be erected on the Cheat and Black Rivers to produce current for commercial use. The Kuhn interests of Pittsburgh, Pa., which are back of the new West Penn Traction & Light Company, capitalized at $27,000,000, are the parties interested in this development. B.

CHICAGO, ILL.—It is reported that the Commonwealth Edison Company is planning the erection of a great power plant on the Calumet River. Title to a tract of land comprising 22 acres was taken several months ago. The object of the company is to furnish power in connection with the prospective electrification of the railroads entering Chicago from the South.

WHEELING, W. VA.—The directors of the Board of Trade have voted to take steps to have the entire street lighting system in the down-town district changed, substituting for the arc lights tungsten lamps mounted on ornamental posts. G. O. Nagel, Seaton Alexander, J. W. Speidel, George W. Lutz and Roy B. Naylor are among those appointed to have the matter in charge. B.

ST. JOSEPH, MO.—The St. Joseph Street Railway, Light, Heat & Power Company plans to begin at once making improvements to its plant to the extent of $100,000. A. J. Purington, general manager, is credited with the statement that among the contemplated improvements is a 4,000-horsepower horizontal turbine generator. The lighting and power capacity of the plant will be increased 75 per cent when the work is finished.

HARRISBURG, PA.—The following

light, heat and power companies have been incorporated, each with a capital stock of $5,000: Adams, Buffington, Blacklick, Banks, Burrell, Brush Valley, Barr, Carroll, Cherry Hill, Cambria, Centre, Conemaugh, East Wheatfield, East Lortay, Green, Jackson, Lower Yoder, Montgomery, Phine Jose, Pine, Portage, Rayne, Richland, Susquehanna, Summer Hill, Stony Creek, Upper Yoder, White, West Wheatfield and West Taylor Township. The incorporators of these companies are F. J. Morrisey, Augustus Weis and J. W. Blough, all of Johnstown.

EUGENE, ORE.—This city is preparing to install a series tungsten ornamental street-lighting system on the principal business streets and in the City Park property.

BOVEY, MINN.—The Mesaba Electric Company is preparing to make a "White Way" between the villages of Bovey and Coleraine.

YOUNGSTOWN, O.—This city is contemplating a bond issue to cover the cost of installing an ornamental lighting system in the business district.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

CHISHOLM, MINN.—The Mesabe Telephone Company will install a central energy system. C.

PITTSFIELD, N. H.—The Union Telephone Company plans soon to extend its line to Barnstead Parade.

ERIE, PA.—The Bell Telephone Company will construct three circuits between this city and Girard, at an estimated cost of $3,500.

MILES CITY, MONT.—The government will build 45 miles of a telephone system on the forest reserve connecting this place with Sheridan, Wyo. C.

GLASGOW, MONT.—The Moore Telephone company's building collapsed, damaging the system considerably. This will necessitate the installation of a new switchboard. C.

MURFREESBORO, TENN. — The Home Telephone Company, of which G. S. Smith is president, plans the construction of a line to Nashville. An eight-mile extension will be built to Lascassas. G.

MILWAUKIE, ORE.—The Southern Pacific Company has been granted a franchise to construct an electric line and telephone and telegraph lines through Milwaukie.

DODGE CITY, KANS.—Work on the Dodge City Exchange of the Arkansas Valley Telephone Company is scheduled to commence early in June. It has been decided to lay all the cables underground.

RICHVILLE, N. Y.—Richville Telephone Company has been incorporated with a capital stock of $9,000. The incorporators are Adelbert A. Gates, A. Fred Spooner, Richville, N. Y.; and Manley E. Johnson, Bigelow, N. Y.

LOUISVILLE, KY.—The L. S. Higdon Telephone Company has been incorporated with a capital stock of $800. The incorporators are Jake Deckard, Babe Meredith, James Meredith, Alex Van Meter and W. H. Miller.

MOBILE, ALA. — The Heart of Baldwin County Telephone Company has been incorporated with an authorized capital of $5,000. The incorporators are L. J. Taylor, R. Van Iderstine, J. H. Meigs, Jonahan Bliss, J. R. Cross, J. A. Graham and J. A. Gunderson.

ELECTRIC RAILWAYS.

(Special Correspondence.)

DAVENPORT, IOWA.—The Tri-State Railway Company will build a line to Bettendorf this season. C.

GLADBROOK, IOWA.—The Tama & Toledo Electric Power Company has been granted a franchise for an interurban line. C.

WOODBURY, TENN.—Major James A. Jones is interested in building an interurban electric railway from Woodbury to McMinnville.

SHELBYVILLE, KY.—The Bluegrass Traction Company is considering the extension of its line from Frankfort to Shelbyville.

LOS ANGELES, CAL.—The Pacific Electric Railroad Company has decided to extend its Van Nuys road through to the new town of Owensmouth.

SANTA BARBARA, CAL.—The proposition to grant a 45-year franchise for a street railway to George A. Batchelder and George I. Cochran has been carried.

OIL CITY, PA. — The Citizens' Traction Company will expend $15,000 in Oil City and Franklin during the summer on betterments to its system.

BURLINGTON, IOWA.—Charles H. Walsh, secretary of the street railway company, announces that the company will spend $200,000 on improvements.

MINNEAPOLIS, MINN.—The street railway company was given permission to build a down town loop for its Minnehaha line and Bloomington Short lines.

DES MOINES, IOWA.—Improvements aggregating $257,995 in cost will be made by the Des Moines City Railway Company. This will include double tracking, and loops and curves, and new equipment. C.

CHATTANOOGA, TENN.—The Chattanooga Railway & Light Company is planning the construction of a traction line from Mission Ridge to Lookout Mountain. G.

SAN ANTONIO, TEX.—The San Antonio Traction Company will install a 3,000-kilowatt generator and the necessary transformers and other machinery in Station B of its power plant here.

FREEPORT, N. Y.—The Freeport Railroad Company is preparing to construct an electric street car line in certain streets of Freeport. One of the stipulations of the charter is that cars will be in operation by August 1, 1913.

PITTSBURGH, PA.—The Board of Trade of the borough of Sewickley, a suburb of Pittsburgh, passed a resolution in favor of a trolley line entering the town. William Dickson has been appointed chairman of a committee to have the matter in charge.

FREEPORT, L. I.—The Village Board has voted a franchise to the Freeport Railroad Company to build a trolley line which will divide the village east and west. The franchise is for 89 years and provides for the operation of a line of cars by electricity.

ST. LOUIS, MO.—It is reported that James Campbell and John Sculin, representing the United Railways; John Scott & Sons, railroad contractors, and Joseph Dickson, Jr., are interested in a project to build an electric railway into the northern suburbs of this city.

TULARE, CAL.—Big Four Electric Railway Company has filed articles of incorporation with a capital stock of $500,000 to build an electric railroad 34 miles in length. The directors of the company are: J. R. Hitchcock, Paul Blankenship and C. L. Russell, Jr., Tulare.

CHICAGO, ILL.—The Chicago & Suburban Traction Company will build an electric belt line to connect Evanston, Elgin, Oak Forest and extend eastward to a point near Hammond, Ind. W. J. C. Kenyon, former president of the Illinois Tunnel Company, is president of the company.

RUTLAND, VT.—It has been announced that $1,000,000 has been added to the capital of the Rutland Railway, Light & Power Company and that there will be built an extension of the street railway line from Poultney to Granville, N. Y. The high-transmission lines of the company throughout the State quarry district will also be extended.

MARYSVILLE, CAL.—The Northern Electric Railroad Company has applied for permission to issue bonds in the sum of $1,100,000, the proceeds to be used for the construction of an electric railroad from Marysville through Colusa to Meridian, in Sutter county, and to bridge Sacramento River at Meridian. The bonds are to run for 30 years and to carry five per cent.

FORT WORTH, TEX.—Steps are being taken to construct an interurban electric railway between Fort Worth and Mineral Wells, a distance of about 70 miles. It is announced that the Mercantile Trust Company, of St. Louis, Mo., has agreed to finance the project and that the company which will construct and operate the road will be composed of St. Louis and Fort Worth men. It is said the total cost of the proposed road will be about $1,000,000. D.

MONTPELIER, IND.—Articles of incorporation have been filed with the Secretary of State for the Montpelier Traction Company, with a capitalization of $15,000. The purpose of the corporation is to construct and operate a traction line from Marion to Montpelier, through Portland. The incorporators and directors are C. L. Smith, A. H. Bonham and N. W. Lacey, of Montpelier; D. E. Binns, of Elrichville, O., and A. E. Townsend, of Doyleston, Ohio. S.

PARSONS, KANS.—Kansas Central Traction Company has been granted a charter with a capital stock of $1,000,000. The new company will build about 70 miles of electric railway, consisting of a line from Parsons to Coffeyville and branches to serve other communities. Authority has also been given this company to establish electric power plants. The incorporators are Phillip Strack, Indianapolis, Ind.; O. C. Randall and A. J. Hiatt, Altamont, Kans.; Barney McDaniel, Mound Valley, Kans.; and David E. Toer, Gwynville, Ind.

INDIANAPOLIS, IND.—The Indianapolis, Newcastle & Eastern Traction Company, capitalized at $1,000,000, has filed articles of incorporation with the Secretary of State. The declared object is to construct and operate an electric line from New Castle to Muncie and, also, to consolidate with, purchase, lease or make working agreements with other electric railway companies in the state or elsewhere and to generate and dispose of electricity for light, heat and power. The incorporators are John C. Todd, Fred A. Likely, William Winters and B. Q. Hendricks.

NEW PUBLICATIONS.

STEEL STACKS.—Bulletin No. 3 in the Engineering and Science Series of Renssaeler Polytechnic Institute contains a discussion by Arthur M. Greene, Jr., on "Bolts, Base Plates and Plating for Steel Stacks." This will be of great value to every engineer engaged in the design of steel stacks.

COAL IN STORAGE.—"Deterioration and Spontaneous Heating of Coal in Storage" is the title of a preliminary report by H. C. Porter and F. K. Ovitz, which has been published as Technical Paper No. 16 by the Bureau of Mines, Washington, D. C. The results of tests are given and these show that there is no loss in samples which are submerged in either fresh or salt water for one year. When exposed to air, crushed coal deteriorates more rapidly than run-of-mine coal. New River coal showed a loss in calorific value of less than one per cent in one year. The greatest loss observed was at Key West, amounting in two years to 1.85 per cent. Losses from spontaneous heating are a more serious matter and the causes of this have been investigated.

PROPOSALS.

ELECTRIC WORK.—Sealed proposals will be received at the office of the Depot Quartermaster, Washington, D. C., until June 17 for the electric work for the addition to Walter Reed General Hospital, Takoma Park, D. C.

ELECTRICAL FIXTURES.—Sealed proposals in triplicate will be received at the office of the Depot Quartermaster, Washington, D. C., until June 11 for furnishing 350 CF-12 fixtures, in accordance with general specifications No. 5.

PYROMETER, RECORDING, ELECTRICAL.—Sealed proposals will be received by the Navy Department, Bureau of Supplies and Accounts, Washington, D. C., until June 25, for one pyrometer to be delivered at the Navy Yard, Washington, D. C., as per schedule 4,635.

FANS, DESK AND BRACKET, COMBINATION.—Sealed proposals will be received by the Navy Department, Bureau of Supplies and Accounts, Washington, D. C., until June 25 for the annual supply of fans to be delivered at the Navy Yard, Brooklyn, N. Y., as per schedule 4,618.

INDUSTRIAL RAILWAY, MOTORS, ETC.—Sealed proposals will be received on June 15 at New London, Conn., for constructing an industrial railway, motors, etc., at Fort Terry (Plum Island), N. Y. Apply to Captain F. T. Arnold, constructing quartermaster.

CONDUCTORS, FLEXIBLE, INSULATING, DOUBLE.—Sealed proposals will be received by the Navy Department, Bureau of Supplies and Accounts, Washington, D. C., until July 2 for 75,000 feet of conductors to be delivered at the Navy Yard, Brooklyn, N. Y., as per schedule 4,632.

LIGHTING SYSTEM.—Sealed proposals will be received at the office of the Constructing Quartermaster, Fort Oglethorpe, Ga., until June 15 for the construction of an electric lighting system. Envelopes containing proposals should be marked "Proposals for Electric Lighting System" and addressed to Captain Guy Cushman, 11th cavalry, constructing quartermaster.

ELECTRIC WIRING AND FIXTURES.—Sealed proposals, in triplicate, will be received at the office of the Constructing Quartermaster, Honolulu, H. T., until June 11 for electric wiring and fixtures for the addition to the hospital at Fort Shafter, Honolulu, H. T. Plans and specifications can be seen either at the office above named or at the office of the Constructing Quartermaster, Fort Mason, Cal.

FOREIGN TRADE OPPORTUNITIES.

(Parties interested in the following item should address the Bureau of Manufacturers, Washington, D. C., and refer to the file number noted.)

No. 8,913. ELECTRIC SIGNS.—The Bureau of Manufactures is in receipt of a communication from an American forwarding firm stating that one of its correspondents in a European country has written that it is interested in electrical moving signs. Houses making a specialty of this class of work are requested to send catalogs and any other information that would prove useful. Communications, etc., should be sent direct to the foreign firm.

FINANCIAL NOTES.

Bank clearings for the first time in several months have made an unfavorable comparison with a year ago. It is pointed out, however, that the decline in speculation in New York and other principal stock market centers is the chief disturbing cause. It is expected that railroad gross earnings will continue to show an increase compared with a year ago, and while the distributive trade will be irregular, it will be upon a better basis than has been witnessed for the best part of the year. A review of the important stocks at leading speculative centers indicates a pretty general decline of from one to two and one-half points.

George G. Fetter, president of the George G. Fetter Lighting & Heating Company, of Louisville, has announced the purchase of all the stock in that company by H. M. Byllesby & Co., of Chicago, and associated interests, which have recently acquired complete control of the Louisville Gas Company and its subsidiary corporation, the Louisville Lighting Company. The Fetter Company is capitalized at $200,000, and has a bonded indebtedness of $100,000. It is stated that appraisal of the property, exclusive of its franchise, indicates a valuation of $300,000. The basis on which the stock was taken over was not announced, but it is understood that its holders received about $422,000. The Fetter Company was organized about four years ago, and after securing a franchise from the city covering eleven blocks in the business district, it erected a small but modern and efficient plant at Bullitt and Water Streets. This has been in operation for the past year, and has been in charge of J. Hoadley Cochran as chief engineer. The company also manufactures ice. The officers are: George G. Fetter, president; Charles H. Sheild, vice-president, and Howard C. Wedekemper, secretary and treasurer. It is possible that the officers will retain their positions, as it is not certain that the company will be merged with the Louisville Lighting Company, the chances favoring its continuance as an independent corporation. The plant will also be kept in operation as at present. The change of ownership became effective June 1.

H. M. Byllesby & Co. have also made arrangements, it is stated, for acquiring a small plant owned by Pike Campbell, which serves a number of large consumers in the retail district. The price at which it was taken over was reported as $50,000. The acquirement of the two plants referred to in addition to the larger properties already in its control puts the Chicago company in a splendid position to dominate the Louisville field. As a matter of fact, the predictions which have been made that all of the public service properties would shortly be operated by the same management seem in a fair way to be realized. It is generally believed in Louisville that the Mississippi Valley Gas and Electric Company, which is in process of organization, will take over not only the four Louisville properties referred to above, but that it will also have charge of the Kentucky Electric Company and the Kentucky Heating Company, the latter a fuel gas concern which is one of the most profitable public service properties in the Ohio Valley. Nothing official regarding the acquisition of these two companies has been given out.

The United Railways Company, of St. Louis, has arranged for an extension of the $1,800,000 Cass Avenue & Fair Grounds five-per-cent bonds, maturing July 1, for ten years, at 4.5 per cent.

The Bell Telephone Company of Canada is arranging to issue $2,500,000 of bonds. It is expected that this issue will be secured by an American house which recently has taken up some large Canadian issues.

It is reported that the net earnings of the National Carbon Company for the quarter ended April 1 last were slightly in excess of $225,000, or an increase of around forty per cent as compared with the corresponding period of 1911.

Stone & Webster are offering $350,000 six-per-cent cumulative preferred treasury stock of the Galveston-Houston Electric Company, at a price to yield 6.25 per cent, and $500,000 Northern Texas Electric Company six-per-cent preferred stock, new issue to yield 6.20 per cent. Both stocks are listed on the Boston Stock Exchange.

Kidder, Peabody & Company are offering $10,000,000 New York Telephone Company first and general-mortgage 4.5-per-cent sinking-fund gold bonds at ninety-eight and three-quarters and accrued interest from May 1. Simultaneously £2,000,000 of these bonds are offered by Baring Brothers & Company in London, and Hope & Company in Amsterdam. These bonds are part of an authorized issue of $75,000,000, of which £5,500,000 and $22,500,000 have been issued. Under this mortgage only $5,000,000 additional bonds may be issued. All bonds of these series, but not any part, are redeemable at 110 on three months' notice. Sinking fund amounts to one per cent.

Dividends.

Arkansas Valley Railway, Light & Power Company; a quarterly preferred dividend of 1.75 per cent, payable June 15 to stock of record May 31.

Brooklyn Rapid Transit Company; a quarterly dividend of 1.25 per cent, payable July 1 to stock of record June 10.

Buffalo General Electric Company; a quarterly common dividend of 1.5 per cent, payable June 30 to stock of record June 20.

Chicago Telephone Company; the regular quarterly dividend of two per cent, payable June 29 to stock of record June 20.

Duluth-Superior Traction Company; a quarterly dividend of 1.25 per cent, payable July 1 to stock of record June 15.

Manila Electric Railroad & Lighting Corporation; a quarterly dividend of 1.5 per cent, payable July 1 to stock of record June 18.

Massachusetts Electric Company; a semi-annual dividend of $2 on preferred shares, payable July 1 to stock of record June 5.

Muskogee Gas & Electric Company; a preferred quarterly dividend of 1.75 per cent, payable June 15 to stock of record May 31.

New Orleans Railway & Light Company; a dividend on the common stock of one per cent, payable July 1 to stock of record June 14.

Standard Gas & Electric Company; a quarterly preferred dividend of two per cent, payable June 15 to stock of record May 31.

Twin City Rapid Transit Company; a quarterly common dividend of 1.5 per cent, and a preferred dividend of 1.75 per cent, both payable July 1 to stock of record June 10.

Reports of Earnings.

NORTHERN OHIO TRACTION & LIGHT.

The Northern Ohio Traction & Light Company reports for the month of April and four months ended April 30, as follows:

	1912	1911
April gross	$221,784	$200,015
April net	93,616	85,253
Surplus after charges	49,795	40,924
Four months gross	845,271	748,886
Four months net	349,733	311,501
Surplus after charges	174,446	134,057

KEYSTONE TELEGRAPH COMPANY.

The Keystone Telegraph Company's report for the month of April and four months ended April 30, compares as follows:

	1912	1911
April gross	$100,110	$ 98,986
Net, after taxes	50,180	49,458
Surplus after charges	25,218	24,911
Four months gross	394,427	385,424
Net, after taxes	196,752	193,080
Surplus after charges	96,871	95,478

UNION RAILWAY, GAS & ELECTRIC COMPANY.

The Union Railway, Gas & Electric Company's reports for April and four months ended April 30, compared as follows:

	1912	1911
April gross	$ 279,735	$ 242,968
April net	108,548	97,226
Surplus after charges	39,401	36,540
Four months gross	1,202,810	1,024,475
Four months net	480,447	420,292
Surplus after charges	208,909	181,006

COMMONWEALTH POWER, RAILWAY & LIGHT.

The Commonwealth Power, Railway & Light Company's report for April and four months ended April 30, compares as follows:

	1912	1911
April gross	$ 490,119	$ 421,924
April net	204,487	175,727
Surplus after charges	83,576	70,646
Four months gross	1,007,486	1,773,761
Four months net	843,732	773,189
Surplus after charges	388,497	364,975

BUFFALO GENERAL ELECTRIC.

The report of the Buffalo General Electric Company for the four months ended April 30, 1912, shows net earnings of $198,189, against $174,783 in 1911. The income account compares as follows:

	1912	1911
Operating revenue	$464,862	$416,185
Expenses and taxes	266,672	241,401
Net	$198,189	$174,783
Other income	13,853	12,995
Total income	$212,043	$187,779
Interest	53,850	47,961
Surplus	$158,193	$139,817

TWIN CITY LINES.

The Twin City Rapid Transit Company's report for April and four months ended April 30, compares as follows:

	1912	1911
April gross	$ 631,462	$ 620,672
April net	305,674	300,732
Charges, taxes and preferred dividends	143,079	140,079
April surplus	162,595	160,653
Four months gross	2,543,072	2,441,711
Four months net	1,162,225	1,151,240
Charges, taxes and preferred dividends	569,317	560,317
Four months surplus	592,908	590,923

DETROIT UNITED RAILWAY.

The Detroit United Railway Company's report for April and four months ended April 30, compares as follows:

	1912	1911
April gross	$ 915,426	$ 802,163
April net	305,674	300,732
Other income	16,395	12,886
Total income	341,776	296,453
Charges and taxes	177,051	176,379
April surplus	164,724	120,073
Four months gross	3,383,637	2,985,356
Four months net	1,157,196	1,063,327
Other income	66,281	55,285
Total income	1,223,477	1,118,612
Charges and taxes	714,216	703,950
Four months surplus	509,260	414,661

MONTREAL LIGHT, HEAT & POWER.

The Montreal Light, Heat & Power Company has issued its pamphlet report for the year ended April 30, 1912. The income account compares as follows:

	1912	1911
Gross	$4,969,255	$4,404,126
Expenses	2,125,239	1,827,786
Net	2,844,015	2,576,340
Interest	485,746	472,051
Surplus†	2,358,269	2,104,289
Dividends	1,360,000	1,275,000
Surplus	998,269	829,289
Deductions*	500,000	476,011
Surplus	498,269	353,278

*Deduction for depreciation and insurance funds.

†Equal to 13.87 per cent on $17,000,000 capital stock, as compared with 12.38 per cent on same stock last year.

KINGS COUNTY LIGHT.

The New York Public Service Commission has issued a report covering the operation of the Kings County Electric Light & Power Company for the year ended December 30, 1911, which compares as follows:

	1911	1910
Operating revenue	$697,513	$642,041
Operating expenses and taxes	412,794	349,792
Operating income	284,719	292,248
Other income	8,094	9,665
Total income	292,813	301,913
Net corporate income	143,031	152,559
Dividends	120,000	120,000
Surplus	23,031	32,559
Previous surplus	566,170	532,362
P. & L. adj. (debit)	15,991	*1,248
P. & L. Surplus	573,210	566,169

*Credit.

PHILADELPHIA RAPID TRANSIT.

The report of the Philadelphia Rapid Transit Company for April and ten months ended April 30, compares as follows:

	1912.	1911
April gross	$1,903,908	$1,824,173
April net	742,020	716,725
Deficit after charges	6,610	18,963
Ten months' gross	18,665,570	17,764,089
Ten months' net	7,189,005	6,779,057
Deficit after charges	214,291	548,398

SCHENECTADY RAILWAY.

The report of the Schenectady Railway Company for the quarter ended March 31, 1912, compares as follows:

	1912	1911
March gross	$275,530	$266,244
Net, after taxes	83,041	87,970
Other income	2,791	3,109
Total income	85,832	91,080
Surplus, after charges	62,235	67,532

KINGS COMPANY LIGHT.

The report of the Kings County Electric Light & Power Company and Edison Electric Illuminating Company, of Brooklyn, for April, 1912, shows net operating revenues of $153,634, an increase of $16,429. The income account, with changes, is as follows:

	1912	Increase
Gross operating revenue	$421,225	$56,719
Total operating expenses	267,591	40,290
Net operating revenues	$153,634	$16,429
Other income	4,558	46
Total income	$158,192	$16,475
Bond discount written off	1,689	.....
Balance	$156,503	$16,475
Fixed charges	70,547	7,500
Surplus	$85,956	$8,975
From Jan. 1 to April 30:		
Gross operating revenue	$1,796,294	$223,273
Total operating expenses	1,090,782	136,027
Net operating revenue	$699,512	$87,246
Other income	18,696	*1,551
Total income	$718,208	$85,695
Bond discount written off	6,756	.....
Balance	711,452	$85,695
Fixed charges	282,187	30,000
Surplus	$429,265	$55,695

ELECTRICAL PROPERTIES COMPANY.

The report of the Electrical Properties Company for the year ending April 30, 1912, shows net earnings of $63,701, against $189,740 the previous year. The income account compares as follows:

	1912	1911
Total income	$ 97,816	$251,841
Expenses, taxes, etc.	34,115	62,101
Net income	$ 63,701	$189,740
Preferred dividends	.....	.....
Surplus	$ 63,701	$189,740
Profit and loss reduction	505	51,103
Previous surplus	231,618	92,981

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	June 3.	May 27.
Allis-Chalmers common (New York)	¾	1
Allis-Chalmers preferred (New York)	2	2
American Tel. & Tel. (New York)	145½	145½
Commonwealth Edison (Chicago)	138	141½
Edison Electric Illuminating (Boston)	*282	282
Electric Company of America (Philadelphia)	12¼	12¼
Electric Storage Battery common (Philadelphia)	55½	55½
Electric Storage Battery preferred (Philadelphia)	55½	55½
General Electric (New York)	167	170
Kings County Electric (New York)	129	129
Manhattan Transit (New York)	2¼	2⅞
Massachusetts Electric common (Boston)	20	20½
Massachusetts Electric preferred (Boston)	93	*95
National Carbon common (Chicago)	118	119
National Carbon preferred (Chicago)	118	117
New England Telephone (Boston)	*152	152
Philadelphia Electric (Philadelphia)	21¼	19¼
Postal Telegraph and Cables common (New York)	83½	84
Postal Telegraph and Cables preferred (New York)	69	69
Western Union (New York)	81¾	83¾
Westinghouse common (New York)	71½	73
Westinghouse preferred (New York)	116	116

*Last price quoted.

PERSONAL MENTION.

JOHN T. HUNTINGTON, Green Bay, Wis., has resigned as manager of the Wisconsin Public Service Company and of the Green Bay Gas & Electric Company.

W. H. ELSON has been appointed superintendent of two of the interurban divisions of the British Columbia Electric Railway Company, Vancouver, B. C.

ARTHUR E. HAYNES, professor of engineering mathematics in the University of Minnesota, has retired on account of physical disability, after a continuous service of over 36 years.

L. E. JACOBSON, auditor of the Green Bay Traction Company, Green Bay, Wis., has been appointed auditor of the Northern Utilities Company, with headquarters at Dixon, Ill.

J. T. NYHAN, general manager of the Macon Railway & Light Company, Macon, Ga., has resigned to become associated with W. J. Massee, who is promoting the Georgia Public Service Corporation.

O. V. MAURER, formerly factory superintendent of the Cleveland Miniature Lamp Works, Cleveland, O., has been appointed manager of the New York Miniature Lamp Works of the General Electric Company.

H. W. FLUHRER, superintendent of the Auburn Telephone Company, who for the past 13 years has been located in Auburn, N. Y., will assume the duties of general manager of the Otsego & Delaware Telephone Company, with headquarters at Oneonta.

F. H. COBLE has resigned as chief of the Testing Department of the United Railways & Electric Company, Baltimore, Md., to accept a position in the Engineering Department of the Edison Electric Illuminating Company, Brooklyn, N. Y.

EMIL G. SCHMIDT, who is president of the County Traction Company, Chicago, Ill., has recently been appointed president of the Des Moines City Railway Company, Des Moines, Iowa. Albert W. Harris, of N. W. Harris & Company, Chicago, having resigned.

R. M. REDDING has been appointed purchasing agent of the Macon Railway & Light Company, Macon Gas Company, Central Georgia Power Company and the Central Georgia Transmission Company, and also manager and secretary of the Macon Gas Company, Macon, Ga.

W. H. WELLS, formerly connected with the Commercial Department of the Edison Electric Illuminating Company, Brooklyn, N. Y., and later with the Metropolitan Engineering Company, of New York City, has recently accepted the position of manager of the Appliance Bureau of the Edison Company.

MALCOLM MacLAREN, professor in the Department of Electrical Engineering, Princeton University, has completed an investigation to determine the advisability of ordering central-station companies to ground all secondary distribution circuits, with particular reference to conditions existing in the Jersey City-Hoboken District, for the New Jersey Board of Public Utility Commissioners.

THOMAS L. PHILLIPS has been appointed engineer of transmission-line construction for the Pacific Light & Power Corporation, which is building a 275-mile, 150,000-volt transmission line from Big Creek to Los Angeles. Mr. Phillips at one time was construction engineer for the Calgary Power Company, and later was connected with the Mount Hood Railway & Power Company, Portland, Ore.

THEODORE N. VAIL, president of the American Telegraph & Telephone Company, was expected to sail from Europe June 5 on either the *Kron Prinz Wilhelm* or the *Olympic*. He will arrive in New York between June 12 and 15. Mr. Vail's trip abroad was a pleasure one and he expected to have no business conferences aside from an informal talk with the British officials on the subject of transatlantic cables.

EVAN J. EDWARDS, associate engineer of the Engineering Department, National Electric Lamp Association, of Cleveland, was married on May 28. With characteristic modesty Mr. Edwards kept the news of the approaching event a secret until the day he left for the home of the bride in Iowa. He was given a rousing send-off by the boys of the Engineering Department. The new Mrs. Edwards was Miss Lucy Sheets, of Williamsburg, Iowa.

FRANK L. PERRY, whose friends in the electrical field are legion, has returned to his old home in Baltimore and will be connected with the Fidelity Trust Company of Baltimore. Mr. Perry's work will be along the line of general business promotion and publicity for the company. He brings to this responsible position a practical experience gained through many years of hard work in the west and in New York.

F. J. BENJAMIN has severed his connection as advertising manager of Pawling & Harnischfeger, Milwaukee, Wis., to accept the position of advertising manager of the *Iron Trade Review*, owned by the Penton Publishing Company, Cleveland, O. Mr. Benjamin has been doing splendid work with the Pawling & Harnischfeger Company and has made very rapid progress in the advertising field. He has had a wide experience in the newspaper business and in the preparation of advertising copy for manufacturers. Upon the occasion of his going to Cleveland, Mr. Benjamin was tendered a farewell by the Advertisers Club of Milwaukee.

OBITUARY.

HOLTON WOOD, Brookline, Mass., who is well known in the electric railway field, died recently. Mr. Wood at different times was connected with the Staten Island Traction Company, of New York City, and the Derby Street Railway Company, Derby, Conn.

HENRY W. BARBOUR, for forty years a chief telegraph operator for the Western Union Telegraph Company, and the third man in length of service in the company, died on May 29 in Brooklyn, N. Y. He had been thirty-two years in Brooklyn, and before that had worked in Bridgeport and New London, Conn.

WILLIAM EDWARD ATHEARN, engineer of equipment for the Western Union Telegraph Company, died on May 29 in Brooklyn, N. Y. He was a native of Massachusetts, and was 55 years old. Mr. Athearn was a graduate of Williams College. He had been in the telephone and telegraph business for many years, having been for thirty years in the employ of the Western Union.

NEW INCORPORATIONS.

NEW ORLEANS, LA.—The Lynwood Light, Power & Water Company has been incorporated with a capital stock of $5,000. Guv S. Crockett is president of the new company.

CHICO, CAL.—The Union Mining & Power Company has been organized by J. F. Entler, E. D. Marsellus, Duncan McRae, William Miller, N. C. Jessee and Thomas Gilbert.

DALLAS, TEX.—The Texas Modern Electric Supply Company has been incorporated with a capital stock of $250,000 for the purpose of manufacturing and selling electrical supplies. Walter G. Endicott, W. I. Davis and R. H. Busby are the incorporators.

WILMINGTON, DEL.—The Storage Battery Safety Lamp Company has been incorporated under the laws of the State of Delaware with a capital stock of $550,000. The incorporators are G. W. May, A. Smith and M. E. Dorsey, all of Wilmington.

OKLAHOMA CITY, OKLA.—The Electric Elevating Platform Rack Company has been incorporated with a capital stock of $12,000 for the purpose of manufacturing electric platform trucks. F. L. McInnis is president of the company.

OWEGO, N. Y.—The H. M. Hirschberg Company has been incorporated with a capital stock of $25,000 for the purpose of manufacturing and dealing in lighting fixtures. The incorporators are W. Huck, Jr., A. W. Dalton, New York, and J. Gerradt, New York.

PORT EWEN, N. Y.—The Frevert Machinery Company has been incorporated with a capital stock of $30,000 to engage in a general mechanical and electrical engineering business. The incorporators are H. Dalton, J. N. Emley and C. E. Mundy, New York, N. Y.

NEW YORK, N. Y.—The Maloney Electric Company has been incorporated with a capital stock of $700,000 for the purpose of manufacturing and dealing in electric supplies. The incorporators are I. J. Weil, E. Blumenthal and J. H. Mueller, all of New York City.

CHICAGO, ILL.—The Illinois Electric Manufacturing Company has been incorporated with a capital stock of $5,000 to manufacture and sell electric motors and electrical apparatus. The incorporators are: A. F. Richmond, James R. Sample, and Edgar E. Benedict.

NEW YORK, N. Y.—The Electric Flasher Company has been incorporated with a capital stock of $25,000 for the purpose of manufacturing electric flashers for advertising purposes. The incorporators are R. A. Witthaus, C. Tatham and E. Conway, New York City.

CAMDEN, N. J.—The American Gas Shut-Off Valve Company has been incorporated with a capital stock of $100,000 for the purpose of manufacturing gas, steam and electric valves. The incorporators are P. P. Menard, G. L. Burlingame and A. Aggerbach, all of Camden.

CLEVELAND, O.—The Eureka Electric Company has been incorporated with a capital stock of $15,000 to deal in electrical machinery, appliances and equipment of all kinds. The incorporators are A. S. Dole, H. H. Coyne, Samuel Lazarus, William Rothenberg and William R. Miller.

DATES AHEAD.

National Electric Light Association. Annual convention, Seattle, Wash., June 10-14.

Electrical Contractors' Association of the State of Illinois. Semi-Annual meeting, Rock Island, Ill., June 14-15.

National Railway Electrical Engineers' Association. Atlantic City, June 12-19.

Minnesota Electrical Contractors' Association. Annual convention, Duluth, Minn., June 17.

Canadian Electrical Association. Annual convention, Ottawa, Ont., June 19-21.

Michigan Section of the National Electric Light Association. Annual convention on board the *Majestic*, sailing from Port Huron, Mich., on June 21 and returning June 25.

National District Heating Association. Annual convention, Detroit, Mich., June 25-27.

American Institute of Electrical Engineers. Annual convention, Boston, Mass., June 25-28.

Society for the Promotion of Engineering Education. Annual meeting, Boston, Mass., June 26-29.

National Electrical Contractors' Association. Annual meeting, Denver, Colo., July 16-19.

Ohio Electric Light Association. Annual convention, The Breakers, Cedar Point, O., July 17-19.

International Association of Municipal Electricians. Annual convention, Peoria, Ill., August 26-30.

International Association for Testing Materials. Sixth congress, New York City, September 3-7.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Pfister, Milwaukee, Wis., September 16-21.

The 1912 Boston Electric Show, Mechanics Building, Boston, Mass., September 28-October 26.

American Electric Railway Association and its five affiliated associations. Annual convention, Chicago, Ill., October 7-11.

New England Section of the National Electric Light Association. Fall meeting, Boston, Mass., October 10-11.

The New York Electrical Show. New Grand Central Palace, New York, October 9-19.

Kansas Gas, Water, Electric Light and Street Railway Association. Annual meeting, Manhattan, Kans., October 17-19.

With the Electrical Manufacturers

John MacKay & Company has removed its offices to the new building of the Toronto General Trusts Corporation, 85 Bay Street, Toronto, Canada.

Eastern Electric Lamp Company, 141 Milk Street, Boston, Mass., is sending out circulars giving prices of Eastern Mazda and Gem lamps. The former is a drawn-wire tungsten lamp.

Chelten Electric Company, Philadelphia, Pa., has issued a new catalog of its electrical specialties, which include push-button wall switches, wall receptacles of several types, attachment plugs, wall cases, signal lights, etc.

The Dearborn Drug & Chemical Works has removed its Indianapolis office to 919 Hume Mansur Building. J. F. McDonnell has succeeded Mr. Clark as manager of that office. Mr. Clark resigned on June 1 to take charge of the Acme Engineering Company.

The Westinghouse Electric & Manufacturing Company will build the single-phase electric locomotives for the New York, New Haven & Hartford Railroad for use on the newly electrified division between New Haven and Stamford, Conn. The total cost will be about $1,000,000.

The Allgemeine Elektricitäts Gesellschaft, Berlin, Germany, has issued a number of bulletins dealing with the applications of electricity to agricultural purposes. One of these describes the use of the electric motor in dairies, it being applied not only for milking machines but also for separators, butter churns, etc. Another bulletin describes the application of electric motors in village shops.

The Green Fuel Economizer Company, Matteawan, N. Y., has found that the redesigning of boilers and of steam-generating appliances in order to secure higher capacity is drawing more attention to the value of economizers utilizing waste heat from the flue gases for preheating boiler feed water. The use of the economizer permits the boiler to be operated under more economical conditions than if the attempt is made to do both the heating and evaporation of the water in the boiler itself.

Alberger Pump & Condenser Company has been incorporated under the laws of the State of New York. The new corporation is a consolidation of the Alberger Condenser Company, Alberger Pump Company, Newburgh Ice Machine & Engine Company. The head office of the consolidated organization is at 140 Cedar Street, New York City.

Western Electric Company has appointed L. F. Philo sales manager of its Buffalo, N. Y., branch house. The sales organization at this branch has been strengthened and the stock of equipment increased. The administration has been arranged so that all matters arising in connection with relations to customers can be handled directly from Buffalo.

Phelps Manufacturing Company, Detroit, Mich., manufacturer of electric heating devices, flashers and specialties, announces the establishment of two branch offices. One of these is located at 924 South Vandeventer Avenue, St. Louis, Mo., and is under the management of R. L. Marten. The other office is at 504 Columbia Building, Cleveland, Ohio, with Arthur B. Avery, as manager.

Economy Fuse & Manufacturing Company, manufacturer of renewable cartridge fuses, has moved its manufacturing plant from Pittsburgh, Pa., to Chicago, Ill., where a more central location is favorable to shipments. An enlarged factory has been located at the corner of Kinzie and Orleans Streets. A city sales office is located in the Ashland Block, Chicago. The Pittsburgh office has still been retained. The company reports rapidly increasing orders from all parts of the country and a number of inquiries from foreign lands.

Monitor Controller Company, 111 South Gay Street, Baltimore, Md., has published a bulletin on its Monitor system of printing-press control. The controller automatically starts, stops, reverses, speeds up or slows down any press, binder or other machine used in the printing and binding industries. The controller is of the remote type, usually involving push-button stations located at convenient points on the machine. The bulletin describes the system very thoroughly and gives a number of typical illustrations of its application in printing offices.

The General Fire Extinguisher Company, Providence, R. I., announces the opening of its Western heating and power piping department. C. D. Allan is department manager with offices in the Society for Savings Building, Cleveland, Ohio, and Homer R. Linn is sales manager with offices at 108 South La Salle Street, Chicago. This department of steam and hot-water forced-circulation heating systems and power-plant piping. Both Mr. Allan and Mr. Linn are experienced engineers in this line, having been formerly connected with Evans, Almirall & Company.

Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., has issued a 24-page booklet, artistically printed and engraved, that deals with the advantages of its private telephone systems, and illustrates and explains how readily these may be installed in large offices, factories, department stores, public institutions, etc. This company manufactures a great variety of equipment for all kinds of private systems and has developed many special features in connection therewith, such as the Combination-Phone, the Inter-Comm-Phone, a special code-call system, etc.

Joseph Dixon Crucible Company, Jersey City, N. J., has published in book form an essay of Elbert Hubbard, entitled "Joseph Dixon, One of the World Makers." This publication, a limited

supply of which is being distributed by the company, has been put into the usually attractive Roycrofter form. It is a tribute to the work of the founder of the Dixon Company, who established the graphite business in 1827 and who, through persistence and in spite of many hardships, developed the early business of the company along such thorough lines that it has continued to be a leader in all branches of the graphite industry.

The Standard Pump & Engine Company, Cleveland, O., has issued catalog No. 12 describing its systems of water supply and line of pumping engines. The latter are adapted to drive by electric motor as well as by other sources of power. This company makes a specialty of manufacturing pumping units and supplying purchasers with complete installations for various types of water-supply systems. The men in its employ have given many years of attention to this particular kind of work and are well qualified to properly provide for every detail which will insure satisfactory working of an installation. A number of tables containing useful information for those engaged in laying out a water-supply system are given in the back of the catalog. A copy of the catalog will be mailed to any reader upon request.

Wirt Electric Specialty Company, Philadelphia, Pa., announces that the suit of the Macallen Company against the Wirt company for alleged infringement of patent on insulating joints has been dismissed with costs. This suit involved claims 1, 2, 4, and 5 on patent No. 514,822 granted on February 13, 1894, to Emil F. Gennert. The patent expired shortly after the suit was brought, so that no injunction could now be issued. After full consideration of the evidence, however, Judge McPherson, sitting in the United States Circuit Court for the eastern district of Pennsylvania holds that the defendants did not infringe.

Thomson Electric Welding Company, Lynn, Mass., has issued a very attractive catalog of its electric welding machines. This 72-page publication is a masterpiece of the engravers' and printers' art. It is replete with illustrations of the great variety of welders manufactured on the designs of Dr. Elihu Thomson, inventor of this process of welding. A low-voltage alternating current obtained by means of a stepdown transformer is employed. The welders usually include this transformer as part of the equipment. They also have clamping and pressure-applying jaws for holding the work. Along with the standard machines for butt and lap welding is a variety of special welders, such as for welding agricultural wheels, tramway rails, tubes, flat bands, rings, chains and wire mesh. The catalog contains also much general information of value to those interested in electric welding.

Western Electric Company, New York, N. Y., has prepared an attractive booklet entitled "Western Electric Household Helps." This booklet is dedicated to the American woman and has been specially prepared by virtue of its delicate appearance and engagingly-written subject matter to appeal strongly to the up-to-date housewife. It shows the decided advantages of electric devices in the household and how these aid in removing the terrors from the much-dreaded regular housework and cleaning. Among the devices illustrated and described are electric irons, toasters, chafing dishes, percolators, warming pads, vacuum cleaners, washing machines, electric motors for sewing machines, electroliers and portable lamps, interphones and electric fans.

The Weston Electrical Instrument Company, Newark, N. J., has issued Bulletin No. 8 describing its miniature precision, direct-current instruments. This is a full line of indicating switchboard and portable ammeters and voltmeters of the pivoted, moving-coil, permanent-magnet type. The general design and construction of these small instruments have been greatly changed from the well known Weston direct-current types, and the refinements of mechanical work have been carried to a high degree. The new line comprises seven distinct groups and 290 standard ranges, of which illustrated descriptions are given in the bulletin. All of the instruments are dead-beat and are designed to be left continuously in circuit under full load without overheating.

Record of Electrical Patents.

Issued by the United States Patent Office, May 28, 1912.

1,027,397. Fastening Device for Panel-Board Cabinets. F. B. Adam, assignor to Frank Adam Electric Co., St. Louis, Mo. Provides a means for screwing or clamping the front plate to the steel-walled casing of the cabinet.

1,027,403. System of Motor-Operated Tree Vibration for Saving Buds and Blossoms from Frost. H. L. Darling, Delta, Colo. An electric motor on each fruit tree sets it in vibration when there is danger from frost.

1,027,404. Terminal Insulator in Junction Boxes or the Like. R. Deibel, assignor to Siemens & Halske Aktiengesellschaft, Berlin, Germany. The insulator overlaps the bottom and has an oil-filled channel.

1,027,415. Motor-Control System. A. M. Gray, assignor to Allis-Chalmers Co., Milwaukee, Wis. Full voltage is impressed on an induction motor, then rotor resistance is gradually reduced and finally impressed voltage is reduced.

1,027,422. Induction Synchronous Motor. C. H. Kicklighter, Newberry, S. C. Provides for removal of magnetic bridges between the pole pieces of the field after the motor has nearly reached synchronous speed.

1,027,430. Explosion Apparatus for Raising and Forcing Water. G. Poore and H. A. Harvey, London, Eng. Part of the water that fills the explosion chamber is electrolytically decomposed, the resultant gases are then electrically ignited, forcing the water up the delivery pipe.

1,027,440. Time-Element Device. G. B. Schley, assignor to Allis-Chalmers Co. An inverse time-element relay for a circuit-breaker includes a rotatable disk in which eddy currents are induced.

1,027,485. Telephone System. O. M. Leich, assignor to Cracraft, Leich Electric Co., Genoa, Ill. Includes a common-battery exchange and a local-battery exchange with special trunking facilities between them.

1,027,494. Telephone Receiver. S. G. McMeen, assignor to McMeen & Miller, Chicago, Ill. A condenser is mounted between the end cap and an internal abutment.

1,027,495. Electrolytic Process. R. J. McNitt, assignor to Roessler & Hasslacher Chemical Co., New York, N. Y. One of the electrodes is a liquid which is maintained at proper temperature by circulation about a cooling surface.

1,027,533. Spirit Level. C. C. Finn, St. Louis, Mo., assignor of one-half to James L. Heath. Includes a dry battery, push-buttons and a miniature incandescent lamp adjacent each bubble tube.

1,027,550. Inductor Magneto. R. C. Lanphier, assignor to Sangamo Electric Co., Springfield, Ill. The rotor periodically bridges the air gaps between the pole pieces and core during its rotation.

1,027,601. Insulator and Support. L. F. Gressett, Ballinger, Tex. Is made in two semicylindrical sections with a central wire channel.

1,027,621. Light Shield. W. N. McComb, New York, N. Y. A wire guard clasps the lamp bulb and holds a set of transparent and translucent sheets.

1,027,628. Elevator. M. C. Schwab, Chicago, Ill. Provides for operating two cars in each elevator shaft, but electrically preventing their coming too close together.

1,027,629. Electric-Motor-Driven Truck. W. J. Spangler, assignor of one-half to R. M. Elliot, and one-fourth to R. Thayer, Philadelphia, Pa. The longitudinal motor shaft is geared to each truck axle through spur and worm gearing.

1,027,633 to 1,027,635. Portable Electric-Light Fixture. L. A. Williamson, Boston, Mass. In the first patent the lamp socket is on the side of a flat cylindrical casing in which is wound extension cord with an attachment plug at its end. In the second patent the plug is on the casing and the socket on the end of the cord. The third patent is a modification of the second fixture with a tubular casing.

1,027,653. Gas Controller, Electric Time Switch, and Other Timing Device. A. Horstmann, G. O. H. Horstmann, E. H. Horstmann, S. A. Horstmann and W. T. Edgar, Bath, England. Includes a rotary dial plate with a discharge arm and cams.

1,027,658. Talking Moving-Picture

Mechanism. O. E. Kellum, Los Angeles, Cal. An electric timer connected to the phonograph controls a motor mechanism on the picture machine comprising a set of electromagnets, armatures, cranks, etc.

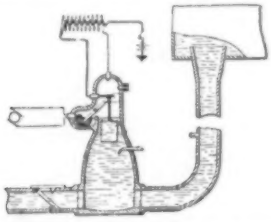
1,027,663. Lamp-Cord Reel. B. F. Miller, Ulysses, Idaho. Includes a spring-rotated spool in a casing, a ratchet and tripping pawl.

1,027,666. Electric Sad Iron and Terminal Box. L. F. Parkhurst, assignor to Diamond Electric Co., Birmingham, N. Y. Includes special connectors for joining the heater terminals to the end of the flexible cable.

1,027,679. Electrically Protected Grillework or Grating. J. P. Williams and H. Huhn, New York, N. Y., assignors to Electric Bank Protection Co. Each of the bars is hollow and contains an inner rod, both being terminals of an alarm circuit that is closed by bending, turning or twisting of the outer bar.

1,027,684. Electric Measuring Instrument. W. E. Beede, New York, N. Y. A portable galvanometer with an adjustable magnetic shunt around the moving coil.

1,027,700. Electric Lighting System for Self-Propelled Vehicles. J. K. Delano, Jr., Chicago, Ill. Includes a dynamo with differential shunt field and an electromagnetic regulating switch.



1,027,430.—Explosion Water Pump.

1,027,708. Metallic Cross-Arm for Poles. C. G. Ette, assignor to Ette Investment Co., St. Louis, Mo. A steel channel forms the cross-arm, into which are fitted upwardly and downwardly projecting metallic insulator pins.

1,027,709 to 1,027,711. Pole Cross-Arm. C. G. Ette, assignor to Ette Investment Co. The first two patents are modifications of the above with both the upright and pendent pins passing through both flanges of the arm. The third patent describes the method of bolting the upright pins of No. 1,027,708.

1,027,712. Insulator-Supporting Device. C. G. Ette, assignor to Ette Investment Co. The pin has a clamp to embrace the web and flanges of the channel arm and a hinge to clamp over the open face.

1,027,739. Electric Oven or Cooker. C. A. Lauzon, assignor to Wm. Heap & Co., Muskegon, Mich. Has an electric heating plate at the bottom of the heating compartment which is heavily lined with heat-insulating material.

1,027,755. Amplifier. G. W. Pickard, Amesbury, Mass. A wireless receiver includes two variable-resistance liquid paths forming one side of a Wheatstone bridge which is unbalanced on receipt of feeble impulses.

1,027,756. Cooling Device for Trolley Wheels. H. Prack, Ottawa, Ill. A forwardly open horn near the middle of the pole admits cooling air through the pole to the wheel.

1,027,763. Flexible Electric Heater. L. C. Rhea, Columbus, O. A blanket has electric resistance wires between its layers.

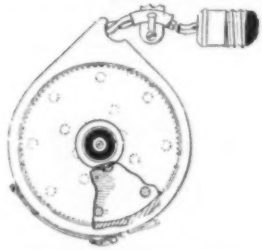
1,027,795. Vacuum Regulator for X-Ray Tubes. B. E. Baker, Hartford, Conn. Has an auxiliary cathode mounted upon the principal anode, a cell in the focal field of the auxiliary cathode, and a gas-producing element in the cell.

1,027,796. Motor Controller. T. E. Barnum, Milwaukee, Wis. An automatic controller provides for periodically starting, slowing down and reversing the motor.

1,027,846. System of Control for Electric Motors. A. J. Horton, assignor to Cutler-Hammer Manufactuirng Co., Milwaukee, Wis. A motor starter includes an eelctromagnetic armature-circuit switch governed partly by auxiliary switches and partly by the starter.

1,027,848. Shade-Holder. Peter Huston, assignor to Adams & Westlake Co., Chicago, Ill. A ring with a flange and annular spring.

1,027,857. Trolley. I. Kocian, Junction City, Ill. Guard arms with spirally grooved rollers are mounted on each side of the wheel.



1,027,633.—Portable Extension Lamp.

1,027,888. Shade-Holder for Incandescent Lamps. H. H. Palmer, Charleston, S. C., assignor of one-half to E. J. Seel. Has a depending flange with a partially flaring edge at its mouth.

1,027,895. Electrically Heated Sad Iron. E. L. Pollard, Dobbs Ferry, N. Y. Has a number of independent heating units.

1,027,898. Electric-Car Switch. L. Radcliff, Danvers, and E. Kilby, Mackinaw, Ill. A trolley-wire switch leading to a branch line.

1,027,984. Electric Writing Machine. I. S. Brown, Bridgeport, Conn. A motor-driven typewriter.

1,028,025. Incandescent-Lamp Base. H. S. Hunter, East Boston, Mass. The lamp bulb is flexibly supported in the screw shell of the base.

1,028,033. Apparatus for Electrically Controlling Machine Tools. C. Krämer, assignor to Felten & Guilleaume-Lahmeyerwerke Actien Gesellschaft, Frankfort-on-the-Main, Germany. A controller for the motor that reciprocates a planer or shaper.

1,028,052. Trolley Guard. H. H. McNeil, New Freedom, Pa. Has a flexible guard on each side of the wheel.

1,028,089. Electric Signaling Apparatus and Circutis. H. Herzog, New York, N. Y., executrix of F. B. Herzog, deceased. An elevator signal system with floor calls indicating in several cars and an answer-back signal at the floors controlled from one or more cars.

1,028,092. Fixture for Vacuum-Tube Lamps. D. McF. Moore, assignor to General Electric Co. Includes tube-supporting rings and an automatic gas-feed device and feed-regulating magnet connected therewith.

Patents That Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired June 4, 1912.

540,239. Telephone System. W. W. Dean, St. Louis, Mo.

540,244. Electric Heater. E. E. Gold, New York, N. Y.

540,305. Closed-Conduit Electric Railway. M. F. Flynn, Stamford, Conn.

540,323. Electromagnetic Winding. O. P. Loomis, Bound Brook, N. J.

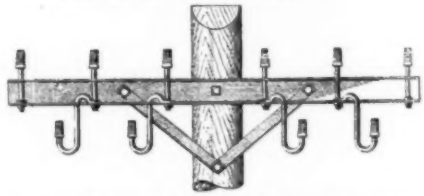
540,325. Electric Trolley for Canal-Boats. A. C. Mather, Chicago, Ill.

540,333. Electric Arc Lamp and Carbon. C. A. Pfluger, Chicago, Ill.

540,341. Electric Burglar-Alarm. J. Tommey, New York, N. Y.

540,351. Dynamo-Electric Machine. G. DeCamp, St. Louis, Mo.

540,358. Electric Switch. J. O. Heinze, Jr., Lynn, Mass.



1,027,708.—Metal Cross-Arm and Insulator Pins.

540,398. Electric Heater. J. E. Meek, Denver, Colo.

540,404. Electric Arc Lamp. H. Radcliffe, Milwaukee, Wis.

540,422. Signal-Transmitting Apparatus and System. H. A. Chase, Boston, Mass.

540,456. Electric Motor. F. Pearce, New York, N. Y.

540,463. Electric Gas-Lighter. G. W. Shepherd, Philadelphia, Pa.

540,480. Apparatus for Use With Electrically Illuminated Signs or Advertisements. E. L. Berry and F. Harrison, London, Eng.

540,486. Trolley for Electric Railways. T. Euphrat, Darien, Conn.

540,487. Ice-Detaching Trolley for Electric Railways. T. Euphrat, Darien, Conn.

540,529. Electrically Controlled Speaking Tube. G. S. Williamson, McKeesport, Pa.

540,540. Underground Electrical Conductor and Method of Manufacturing Same. J. H. Croskey and J. Locke, Pittsburg, Pa.

540,557. Electric Regulator. J. McKim, Weir, Kans.

540,569. Conduit Electric-Railway System. C. M. Allen, San Francisco, Cal.

540,608. Apparatus for Electrically Purifying Water. G. M. Collier and R. T. Detlefs, Cleveland, O.

Reissue 11,498. Electrical Signaling System. B. A. Fiske, U. S. Navy.